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TECHNICAL REVIEW COMMENTS ON THE PROPOSED PLAN FOR SKINNER LANDFILL

Prepared for:

Skinner Landfill PRP Group

September 21, 1992

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TECHNICAL REVIEW COMMENTS
ON THE REMEDIAL INVESTIGATION, BASELINE RISK ASSESSMENT, FEASIBILITY STUDY AND PROPOSED PLAN
FOR SKINNER LANDFILL
UNION TOWNSHIP OF BUTLER COUNTY, OHIO

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The data obtained by USEPA during the Remedial Investigation do not support the conclusion that the buried lagoon and active landfill are significant sources of actively migrating chemical constituents. Groundwater data from the site show that the extent of contamination emanating from the buried lagoon and landfill areas is limited to the immediate vicinity of the lagoon, even after more than 15 years of uncontrolled infiltration of precipitation through these materials without any engineered controls to limit potential pollutant migration. The soil boring data obtained by drilling through the buried lagoon materials can not be relied upon to establish the extent of subsurface impacts because of 1) possible carry-down of contamination during the collection of samples due to the sticky nature of the waste materials, and 2) the inappropriate combination of soil vapor data measured with three different instruments.

The degree of human health risk posed by the site under existing site conditions has been overstated in the USEPA Baseline Risk Assessment. Carcinogenic risks exceeding one new case of cancer among a population of 100 individuals similarly exposed over their lifetime (10^{-2}) were calculated for situations involving direct exposure (dermal absorption and/or ingestion) to on-site soils. However, this calculation used both improper data and improper methods. The Baseline Risk Assessment improperly included data from a soil sample now buried by four to eight feet of debris among the data used to calculate risks from direct contact with on-site soils. The Baseline Risk Assessment improperly assumed a residential rather than recreational exposure pathway for direct contact with surface soils located more than 1000 feet from the nearest permanent residence. Finally, the Baseline Risk Assessment failed to include average-case risk conditions which would have shown baseline human health risks to be within the acceptable risk range (i.e., less than 10^{-4}). The net effect of these instances of improper methodology in the Baseline Risk Assessment is that current and future risks potentially posed by the site are overstated. Because these overstated risks were then used to develop the general response actions and to evaluate remedial alternatives in the Feasibility Study, the level of appropriate remedial action has also been overstated.

The USEPA has established guidelines pertaining to the remediation of CERCLA landfills through the NCP and other CERCLA guidance documents. These guidelines identify landfills as the type of site where treatment may be impracticable due to the size and heterogeneity of the landfill waste. Nevertheless, the Feasibility Study justified the selection of an incineration alternative on the basis that the buried lagoon materials constitute a "hot spot" as described in the CERCLA landfill guidance and a "principal threat" as described in the NCP. These characterizations of the site are not supported by the data obtained during the RI/FS.

II. In selecting the preferred remedial alternative, the Proposed Plan did not consider all of the nine evaluation criteria established by the NCP appropriately.

According to the Proposed Plan, all of USEPA's remedial alternatives are expected to be protective of human health and the environment in the long term. In addition, the Proposed Plan states that 1) they all meet chemical-specific ARARs to the same degree, 2) with one possible exception they all meet action-specific ARARs, and 3) they all meet location-specific ARARs. However, this conclusion overlooks the fact that on-site incineration can not meet the location-specific ARAR of the State of Ohio's hazardous waste facility siting requirements. Section 3734.05(D)(6)(g)(i) of the Ohio Solid and Hazardous Waste Disposal Law states that *"[t]he [hazardous waste facility] board shall not approve an application for a hazardous waste facility installation and operation permit unless it finds and determines that: ... the active areas within the new hazardous waste facility ... are not located or operated within ... [t]wo thousand feet of any residence, school, hospital, jail or prison"*. This requirement can not be met at the Skinner site.

The Proposed Plan also states that all of the USEPA alternatives meet the objective of reducing contaminant mobility, toxicity, and volume through treatment with respect to groundwater, but that incineration alternatives are more effective because they provide additional treatment of the buried lagoon soils. However, this conclusion overlooks the following facts: 1) incineration would actually increase the amount of waste materials disposed on the site because there would be no volume reduction during burning, and because stabilization of the ash would require the addition of material to the waste; and 2) capping (although it is not treatment) minimizes percolation and thus reduces the movement of contaminants to the groundwater, thereby reducing the volume of potentially impacted groundwater and reducing its potential toxicity.

The Proposed Plan acknowledges that the incineration alternatives are less protective of human health and the environment in the short-term; however, the magnitude and significance of the additional risks involved were not fully assessed. In addition, the Proposed Plan erred in concluding that incineration is more effective in the long-term and more permanent than containment. This is not the case because 1) the proposed caps are capable of resisting erosion for approximately 8,300 years even if they are not maintained, and 2) the incineration alternatives involve landfilling of the residual ash which means that re-evaluation of the site will still be required every five years.

The Proposed Plan also incorrectly concluded that all alternatives were equally implementable because it failed to fully consider that the technical requirements for designing, permitting and operating an incinerator have significantly greater complexity than those for containment. Furthermore, because 1) all of USEPA's alternatives meet the requirements of the NCP and 2) incineration is no more permanent than containment, cost-effectiveness should have been considered. If USEPA's containment alternatives did not sufficiently meet the objective of treating on-site soils, a less costly alternative that combined containment with limited treatment of impacted soils should have been developed and evaluated as part of the Feasibility Study. (See Section 4 of this document.) Finally, it is clear from the comments made at the two public meetings that there are strong community objections to on-site incineration, and that capping has greater community acceptance.

III. Incineration is an inappropriate remedy because the risks posed by excavation have been understated or ignored.

In addition to organic and inorganic chemicals, nerve gas, mustard gas, incendiary bombs, phosphorus, flame throwers, cyanide ash, and explosive devices were reportedly buried at the site, and there may be methane gas and biohazards (i.e., pathogenic microbial agents) present in the landfill. Excavation of the buried lagoon will necessarily 1) create new pathways for exposure of the public (e.g., airborne emissions); 2) increase the significance of potential migration pathways (e.g., run-off from and enhanced percolation of rain-water through the excavation); and 3) involve the potential hazards of explosivity, flammability, combustibility, infectious diseases, chemical toxicity, nuisance odors, and fugitive dust generation. The Proposed Plan did not fully consider all of these potential risks, or their potential additive effects, in its selection of a preferred remedial alternative. In addition, the Proposed Plan did not consider the potential for these risks to be prolonged because of unexpected materials handling problems or other operational delays.

IV. An appropriate remedy (which combines features of several USEPA alternatives) would consist of the following elements: 1) a cap over the buried lagoon and active landfill areas; 2) soil vapor extraction in the soils beneath the buried lagoon, if feasible; 3) groundwater collection and treatment at the downgradient side of the potential source areas, if necessary; and 4) institutional controls (fencing, deed restrictions, and extension of public water supply).

This remedy is more appropriate because it is more protective of human health than incineration (because it avoids the substantial potential short-term risks posed by excavation of the buried lagoon); meets chemical- and action-specific ARARs to the same degree as incineration; meets location-specific ARARs to a greater degree than incineration; is as effective in the long-term and as permanent as incineration; reduces contaminant mobility, toxicity, and volume through treatment of soil and groundwater (if necessary) to a greater degree than containment alone; is more effective in the short-term than incineration; is more readily implemented than incineration; is less costly than incineration; and (based on comments made during the May 20, 1992 and July 29, 1992 public meetings) is likely to have greater public acceptance than incineration.

1.0 INTRODUCTION

1.1 Purpose

This report presents the results of a technical evaluation performed by Dunn Corporation on behalf of the Skinner Landfill PRP Group. The report was prepared for presentation to USEPA as part of the Group's comments on USEPA's Phase I Remedial Investigation, Phase II Remedial Investigation, Baseline Risk Assessment, Feasibility Study and Proposed Plan for the Skinner Landfill Superfund Site. USEPA is required to evaluate and respond to public comments and, if appropriate, amend the Proposed Plan prior to issuance of a Record of Decision (ROD).

1.2 Approach

The technical evaluation presented in this report is based on a thorough review of the following USEPA documents:

- The Phase I Interim Remedial Investigation Report for Skinner Landfill Site, West Chester, Ohio, February 1989;
- The Phase II Remedial Investigation Report of the Skinner Landfill Site, West Chester, Ohio, May 1991;
- The Baseline Risk Assessment Report for the Skinner Landfill Site, West Chester, Ohio, Revised/Final, June 1991;
- The Feasibility Study Report for the Skinner Landfill Site, West Chester, Ohio, Finalized April 1992; and
- The Proposed Plan for the Skinner Landfill Site, West Chester, Ohio, issued April 1992.

These reports were examined and compared with the National Contingency Plan (NCP) and applicable USEPA regulatory guidance documents. This examination also addressed the questions of whether good scientific and engineering principles and practices were adhered to during the RI/FS process and whether the findings, conclusions and recommendations of these reports are technically sound or warranted. Detailed comments on the four technical reports are presented in Appendix A.

2.0 DISCUSSION OF TECHNICAL FINDINGS

Detailed review of USEPA's technical reports for the Remedial Investigation, Baseline Risk Assessment, and Feasibility Study raises questions with respect to USEPA's characterization of 1) the extent and significance of contaminant migration, 2) the magnitude and significance of existing risks, and 3) the appropriate level of remedial response.

2.1 Extent of Contaminant Migration

The data obtained by USEPA during the Remedial Investigation do not support the conclusion that the buried lagoon and active landfill are significant sources of actively migrating chemical constituents. Groundwater data from the site show that the extent of contamination emanating from the buried lagoon and landfill areas is limited to the immediate vicinity of the lagoon, even after more than 15 years of uncontrolled infiltration of precipitation through these materials without any engineered controls to limit potential pollutant migration. The soil boring data obtained by drilling through the buried lagoon materials can not be relied upon to establish the extent of subsurface impacts because of 1) possible carry-down of contamination during the collection of samples due to the sticky nature of the waste materials, and 2) the inappropriate combination of soil vapor data measured with three different instruments.

2.1.1 Groundwater Data

The groundwater data for the site simply do not show the presence of contamination attributable to the buried lagoon materials or the landfill area. If the buried lagoon materials and landfill area were sources of contaminants for groundwater, a plume -- a coherent, consistent pattern of contamination -- would be present. The absence of an identifiable groundwater plume is a strong indication that the buried lagoon materials have very little current or future environmental mobility, and that the landfill area is not a significant source of releases to the environment. Given the setting of the buried lagoon materials at the site (above the water table and below 20 feet of demolition debris), this lack of mobility means that there is no mechanism for exposing individuals or organisms to these materials, and the lack of exposure means that there is no risk to human health and the environment.

A significant reason for the restricted extent of contaminant migration from the buried lagoon into groundwater is the environmental immobility of pesticide and polynuclear aromatic compounds, which have a much greater affinity for being adsorbed onto soil particles than being dissolved in water. The effects of this behavior are unambiguously illustrated by the site data -- not one pesticide or polynuclear aromatic compound was reliably found (i.e., consistently reported at similar concentrations without estimation or possible artificial origin) in groundwater, even at wells nearly adjacent to the buried lagoon. In fact, USEPA's Proposed Plan states:

> *"The majority of compounds in the waste lagoon are largely immobile, because they bind tightly to the clayey soils below the waste lagoon, and are not dissolved by water." (pg. 5)*

Analytical data for groundwater samples also show that even the more mobile volatile organic compounds (VOCs) are not migrating away from the buried lagoon. Tabulation of groundwater data by well for the four rounds of sampling during the Phase I and Phase II Remedial Investigations shows that toluene, the chief volatile constituent in the buried lagoon materials, is not reliably found in any well on the site. USEPA's Proposed Plan states:

> *"Significant migration has been hindered, to date, by the clayey soils under most of the waste lagoon and because the waste lagoon is normally wholly above the water table." (pg. 9)*

2.1.2 Soil Boring Data

The extent of impacts in the soils beneath the buried lagoon materials has been over-estimated in the RI/FS for the following reasons: 1) the waste lagoon (WL) borings were drilled through the waste materials, instead of being angled in from the side (so they would not have to be drilled through waste materials); based on the nature of the wastes and the analytical data from these borings, this very likely resulted in waste materials being carried down along the borehole by the drilling equipment; and 2) field screening data – organic vapor readings on soil samples from the WL borings obtained using three different field instruments– were used to characterize the extent of soil impacts; because these data are not truly comparable, this resulted in an inaccurate assessment of impacts.

Carry-Down

Several of the WL borings encountered sticky, tar-like or oily materials at the position of the bottom of the buried lagoon. These materials proved to be so persistent that they had to be sand-blasted off the augers during decontamination, even after the prolonged abrasion of drilling the hole and reversing the augers to abandon the boring. This indicates a high likelihood that such materials were carried down the boring with the augers, making the final sampling data inaccurate.

Other evidence supporting the likelihood of carry-down includes the presence of a piece of concrete recovered from boring WL-04 at a depth of 23.5 feet, below the bottom of the buried lagoon (and the bottom of the overlying demolition debris). Since all samples recovered both below and for seven feet above this depth were natural soils, the only way the concrete could have gotten to this depth is by falling into or being dragged down the borehole.

The analytical data for soil samples from the WL borings support rather than contradict the hypothesis that carry-down occurred. There are often rather remarkable similarities of compounds and concentrations among samples from a given borehole, typically showing essentially no change in concentration with depth. If a compound had migrated downward with percolating recharge or by other natural mechanisms, its vertical concentration profile would gradually decrease with depth. On the other hand, a nearly constant concentration vs. depth relationship would be expected if carry-down had occurred.

Soil Vapor Measurements

The Phase II Remedial Investigation Report placed substantial weight on field screening data when presenting and characterizing the extent of impacts in soils beneath the buried lagoon (i.e., Figures 5.1 through 5.5). There are several problems with this approach. First, the data were obtained using three different organic vapor instruments -- an OVA, an HNu, and an OVM. Because these instruments use different detection technologies, they are sensitive to different chemicals. For example, an OVA will detect methane but an HNu will not. In addition, since the readings are qualitative rather than compound-specific, the data are not comparable.

Second, comparison of the field screening data and the analytical data indicates that the field screening data are not a reliable indicator of the concentration of VOCs present in the sample. Rather, there is a tendency for high field screening readings to be associated with sandy soils and low readings to be associated with clayey soils -- regardless of the concentration of VOCs in the sample. This is understandable because air/vapors can move more readily through sandy soils and sandy soils will present a greater surface area to the air/vapor phase during testing. Rather than using the field screening data to characterize the extent of soil impacts, the Phase II Remedial Investigation should have placed greater emphasis on the data obtained from laboratory analysis of these materials.

2.1.3 Implications for Future Migration

In addition to showing that minimal contaminant migration has occurred to date, the data from the Remedial Investigation also suggest very strongly that future migration will not be significant, contrary to assumptions made in the Baseline Risk Assessment. During the 15-year period between the burial of the lagoon materials in 1976 and the conclusion of the Phase II Remedial Investigation in 1991, precipitation (i.e., rain, sleet, and snow-melt) that fell on the buried lagoon was free to percolate through the potential source materials and migrate to the water table. The existing groundwater data show that the amount of migration that **actually** occurred during this time is very limited. If the buried lagoon materials were going to release a significant amount of contaminants as postulated in the Baseline Risk Assessment, these compounds should already be showing significant mobility. In fact, this mobility has not been demonstrated by the data.

2.2 Risks from Existing Conditions

The Baseline Risk Assessment has overstated the degree of human health risk posed by the site under existing site conditions. In the Baseline Risk Assessment, USEPA calculated chemical-specific, risk-based, maximum acceptable concentrations for various chemicals of concern based on a 10^{-4} to 10^{-6} risk level for carcinogens and a hazard index of 1.0 for non-carcinogens (as specified in the NCP). The only carcinogenic risk exceeding the upper threshold of one new case of cancer among a population of 10,000 individuals similarly exposed over their lifetime (10^{-4}) was the 10^{-2} risk calculated for direct exposure (dermal absorption and/or ingestion) to on-site soils. This exposure pathway also represented the greatest part of the non-carcinogenic risks. However, the calculation of these risks used both improper data and improper methods.

2.2.1 Improper Data

The Baseline Risk Assessment improperly included data from a soil sample now buried by four to eight feet of debris among the data used to calculate risks from direct contact to on-site soils. During the Phase I RI, a sample collected from the surface at location SS-07 reportedly contained one of the PCB isomers (Arochlor 1254) at a concentration of 980 ppm. Inclusion of this data point in the evaluation of risks posed by direct contact (dermal absorption and/or ingestion) with on-site soils resulted in a calculated cancer risk of 10^{-2}.

However, examination of the topographic maps from the Phase I and Phase II RI reports clearly shows that this location is now under at least four to eight feet of debris that USEPA allowed to be placed at the site after 1985 and is not available for direct contact by humans. If this data point is excluded from the evaluation of risks, the existing cancer risks from direct contact with on-site soils are only slightly higher than 10^{-4}, the upper limit of the acceptable risk range.

2.2.2 Improper Methods

USEPA improperly assumed a residential rather than recreational exposure pathway for direct contact with surface soils located more than 1000 feet from the nearest permanent residence. The risks calculated by USEPA for the seven polynuclear aromatics, pesticides, and dioxins mentioned above assumed direct contact through residential land use. However, the three locations at which these compounds were found are more than 1000 ft from the nearest permanent residence. Thus, the actual risks, which are more appropriately considered as resulting from direct contact through recreational land use -- and which should have been calculated using "at-the-surface" soil concentrations of chemicals instead of all concentrations "near-the surface", will be below 10^{-4}, within the acceptable risk range as defined by the NCP.

USEPA failed to include average-case conditions in its Baseline Risk Assessment. Due to the often overly conservative and potentially unrealistic nature of worst-case estimates, the current guidance for risk characterization has identified the need to evaluate "average-case" risks. The need for addressing central tendencies of risk was outlined in a February 26, 1992 memorandum from F. Henry Habicht II (USEPA Deputy Administrator, Office of the Administrator) to Assistant Administrators and Regional Administrators. In this memorandum, Habicht stated (pg. 21):

> *"EPA risk assessments will be expected to address or provide descriptions of (1) individual risk to include the* ***central tendency*** *and high end portions of the risk distribution, (2) important subgroups of the population such as highly exposed or highly susceptible groups or individuals, if known, and (3) population risk. ... With the exception of assessments where particular descriptors clearly do not apply, some form of these three types of descriptors should be* ***routinely*** *developed and present for EPA risk assessments." (emphasis added)*

If the Baseline Risk Assessment for the Skinner site had used average-case exposure point concentrations, exposure times, exposure frequencies, and exposure durations, it would likely result in baseline human health risks at least one order of magnitude lower than those predicted in the current report which used worst-case conditions. All exposure scenarios would, therefore, be well within the acceptable risk range, as defined in the NCP, without the need for further action.

The Habicht memo also states that "... worst case scenarios should not be termed high end risk estimates." The memo describes the worst case scenario as follows:

> *A "worst-case scenario" refers to a combination of events and conditions such that, taken together, produces the highest conceivable risk. Although it is possible that such exposure, dose, or sensitivity combination might occur in a given population of interest, the probability of an individual receiving this combination of events and conditions is usually small, and often so small that such a combination will not occur in a particular, actual population."*

Nevertheless, it is clear from the assumptions made throughout the Baseline Risk Assessment that a worst case analysis was performed. Among these assumptions are 1) that all of the selected chemicals of concern pose risks, 2) that these risks are additive regardless of differences in physiological effects, 3) that there is currently residential exposure to site-wide soils, 4) that there will be future residential exposure to the buried lagoon soils and future residential use of groundwater adjacent to the lagoon, and 5) that individuals will be exposed to the maximum concentrations of chemicals found at the site regardless of the physical setting (e.g., buried under 20 feet of debris) of the materials actually containing that concentration.

The net effect of these instances of improper methodology in the Baseline Risk Assessment is that current and future risks potentially posed by the site are overstated. Because these overstated risks were then used to develop the general response actions and to evaluate remedial alternatives in the Feasibility Study, the level of appropriate remedial action has also been overstated.

2.3 Regulatory Characterization of Site

USEPA, through the National Contingency Plan (NCP, March 1990; 40 CFR 300.430(a)(1)(iii)) and its CERCLA landfill guidance (Conducting Remedial Investigation/Feasibility Studies for CERCLA Municipal Landfill Sites, February 1991), has established a regulatory framework for evaluating the remediation of CERCLA municipal landfills. The CERCLA landfill guidance states (pg. ES-1):

> *"The NCP contains the expectation that containment technologies will generally be appropriate remedies for wastes that pose a relatively low-level threat or where treatment is impracticable. Containment has been identified as the most likely response action at these sites because (1) CERCLA municipal landfills are primarily composed of municipal, and to a lesser extent hazardous wastes; therefore, they often pose a low-level threat rather than a principal threat; and (2) the volume and heterogeneity of waste within CERCLA municipal landfills will often make treatment impractical."*

Nevertheless, the Proposed Plan justifies the selection of an incineration alternative on the basis that the buried lagoon materials constitute a "hot spot" as described in the CERCLA landfill guidance and a "principal threat" as described in the NCP. These characterizations of the site are not supported by the data obtained during the RI/FS.

2.3.1 Inapplicability of Hot Spot Concept

According to the CERCLA landfill guidance (pg. ES-3), treatment of hot spots within a landfill may be considered practicable when the wastes are situated in discrete and accessible locations within the landfill, when they present a potential principal threat to human health and the environment, and when the hot spot is large enough so that its remediation will significantly reduce the potential risks yet small enough that it is reasonable to consider removal and/or treatment. However, proper application of the CERCLA guidance indicates that the buried lagoon is not a hot spot because the buried lagoon material does not represent a principal threat (as discussed below), it is not accessible, and its remediation would not reduce site risks.

In the Proposed Plan (pg. 9), the mobility of liquid wastes potentially contained within as many as 7000 supposedly intact drums within the lagoon is used to justify the conclusion that there is a principal threat. There are several problems with this supposition. First, the method used to estimate the potential number of drums is questionable. The Feasibility Study (Appendix I) assumed that "as indicated from historical site observations" drums were stacked two-high, side-by-side within the entire area of geophysical anomalies. If this were even close to actual conditions, at least one of the eight waste borings drilled through this part of the buried lagoon should have encountered drums. In fact, no drums were encountered.

Second, the assumption that there are any intact drums within the buried lagoon is not supported by the evidence. In fact, aerial photographs taken in 1976 just before the lagoon was buried show that the drums present at that time were piled randomly along sloping surfaces and in swales, did not generally have lids, and showed signs of being rusted and partially crushed. The empty, crushed, and/or deteriorated condition of on-site drums was confirmed by observations made during an inspection of the site in 1985 by USEPA's REM II Contractor.

Thus, the USEPA's evidence does not support the supposition that there are discrete accumulations of large numbers of intact drums potentially containing free liquids at the site. Furthermore, the buried lagoon materials are currently buried under 20 feet of demolition debris and are clearly not accessible. Finally, as discussed below in Section 3, the excavation and incineration of these materials will not significantly reduce the potential risks posed by the site. In conclusion, there is no "hot spot" at the site -- neither the buried lagoon nor the landfill -- which would benefit by being excavated and separately managed.

2.3.2 Inapplicability of Principal Threat Concept

Based on the NCP and on USEPA's discussions of principal threat in the Feasibility Study (pg. 3-5) and Proposed Plan (pg. 9), the key elements relevant to determining whether a principal threat exists are the presence of highly toxic and/or highly mobile contaminants that can not be reliably contained and which would pose a significant risk should exposure occur. The Phase II Remedial Investigation Report states:

> *"Chemicals of concern [in the buried waste lagoon] include volatile organic compounds, semi-volatile organic compounds, pesticides, metals and very low levels of PCB's, dioxins and furans. ... The pesticides revealed during the investigation are, however, largely immobile, bind tightly to the clayey soils and have a low solubility in water." (pg. 73)* and *"The base of the waste lagoon is located above the water table and direct interaction between the lagoon wastes and groundwater is minimal". (pg. 80)*

This language clearly indicates that the wastes are not "highly mobile". (See also the quotation from the Proposed Plan, pg 5, cited above, and Section 2.1 of this document). The Phase II Remedial Investigation Report further indicates that the VOCs detected (sporadically) in the groundwater downgradient of the lagoons are a result of surface water infiltration through the waste– a condition typically found at landfills which are not properly covered. This condition could be readily and reliably contained with the installation of a low-permeability cover and groundwater collection system.

The mere presence of the buried lagoon materials at the site does not mean that exposure will occur. Although future risk scenarios were based on residential use of the waste disposal areas and residential use of groundwater from this immediate area, USEPA representatives acknowledged at the May 20, 1992 public meeting that these uses are highly unlikely. An evaluation of the ability of USEPA's proposed cap design discussed elsewhere in this report shows that the cap will effectively prevent exposure by direct contact for about 8,300 years, even without maintenance.

Site data shows that no contaminants are actively migrating from the lagoon, not even the compounds with greater potential mobility (the VOCs). Since mobility will be further reduced by capping and since capping can effectively prevent future exposure, reliable containment of the buried lagoon is possible and exposures will not occur. Thus, applying the criteria established by the NCP to the Skinner Landfill clearly shows that the buried lagoon is not a principal threat at which treatment is practical.

3.0 DISCUSSION OF USEPA'S ALTERNATIVES

USEPA developed and evaluated five remedial alternatives in its FS:

1) No Action.

2) Excavation and incineration of the buried lagoon;
Capping of the stabilized incineration residuals and the landfill.

3) Capping of the buried lagoon and landfill with a "RCRA multi-media" cap.

4) Capping of the buried lagoon and landfill with an "Ohio solid waste" cap.

5) Excavation and incineration of the buried lagoon;
Capping of the stabilized incineration residuals and the landfill;
Treatment of VOCs in soils beneath the capped area with soil vapor extraction.

All of the action alternatives contained several common elements -- fencing, deed restrictions, extension of public water supplies, groundwater diversion, groundwater collection and treatment, surface water and runoff control (provided by the capping), and monitoring. Although four action alternatives were listed, from a practical standpoint, USEPA evaluated only two alternatives -- incineration and capping. The USEPA's preferred alternative is Alternative No. 5.

3.1 Discussion of USEPA's Comparison of Alternatives

In selecting the preferred remedial alternative, the Proposed Plan did not consider all of the nine evaluation criteria established by the NCP appropriately. According to the Proposed Plan (pg. 16), *"[a]ll alternatives under consideration (except the No Action alternative) are expected to be protective of human health and the environment in the long term"*. In addition, the Proposed Plan states that 1) the alternatives all meet chemical-specific ARARs to the same degree (pg. 17), 2) with one possible exception they all meet action-specific ARARs (pg. 17), and 3) they all meet location-specific ARARs (pg. 18).

However, this conclusion overlooks the fact that on-site incineration can not meet the location-specific ARAR of the State of Ohio's hazardous waste facility siting requirements. Section 3734.05(D)(6)(g)(i) of the Ohio Solid and Hazardous Waste Disposal Law states that:

> *"The [hazardous waste facility] board shall not approve an application for a hazardous waste facility installation and operation permit unless it finds and determines that: ... the active areas within the new hazardous waste facility ... are not located or operated within ... [t]wo thousand feet of any residence, school, hospital, jail or prison".*

This requirement can not be met at the Skinner site.

The Proposed Plan also states that all of the USEPA alternatives meet the objective of reducing contaminant mobility, toxicity, and volume through treatment with respect to groundwater, but that incineration alternatives are more effective because they provide additional treatment of the buried lagoon soils (pg. 18). However, this conclusion overlooks the following facts: 1) incineration would actually **increase** the amount of waste materials disposed on the site because the volume of the waste materials would not be reduced during burning, and because stabilization of the resulting ash would require the addition of material to the waste; and 2) capping (although it is not treatment) minimizes percolation and thereby reduces the movement of contaminants to the groundwater, thereby reducing the volume of potentially contaminated groundwater and reducing its potential toxicity.

The Proposed Plan acknowledges that the incineration alternatives are *"considered to be less protective of human health and the environment over the short-term"* (pg. 18); however, the magnitude and significance of the additional risks involved were not fully assessed. The Proposed Plan incorrectly concluded that incineration is more effective in the long-term and more permanent than containment. This is not the case because 1) the proposed caps are capable of resisting erosion for approximately 8,300 years even if they are not maintained, and 2) the incineration alternatives involve landfilling of the residual ash which means that re-evaluation of the site will still be required every five years.

The Proposed Plan also incorrectly concluded that all alternatives were *"equally implementable"* (pg. 19) because it failed to fully consider that the technical requirements for designing, permitting and operating an incinerator have significantly greater complexity than those for containment. In addition, because all of USEPA's alternatives meet the requirements of the NCP, and because incineration is no more permanent than containment, cost-effectiveness was not appropriately considered. If USEPA's containment alternatives did not sufficiently meet the objective of treating on-site soils, a less costly alternative that combined containment with limited treatment of highly contaminated soils should have developed and evaluated as part of the Feasibility Study. (See Section 4 of this document.) Finally, it is clear from the comments made at the two public meetings that there are strong community objections to on-site incineration, and that capping has greater community acceptance.

In addition to inappropriately considering the nine NCP criteria, USEPA's selection of a remedial alternative did not use all applicable USEPA guidance. The EPA's Risk Assessment Guidance for Superfund: Volume 1-Human Health Evaluation Manual, Part B (EPA/540/R-92/003), which provides methodologies for the development of risk-based preliminary remediation goals for CERCLA sites, was not used. Nor was Part C of this guidance (EPA/540/R-92/004), which provides methods for assessing remedial alternatives and their associated human health risks during the evaluation and comparison of alternatives in the FS.

3.2 Problems with Excavating Buried Lagoon Materials

Excavation of the buried lagoon materials for on-site incineration unnecessarily poses potential unknown risks, creates new risks, and increases existing risks. USEPA considered only one of the potential risks posed by excavation in its FS in spite of the existence of considerable CERCLA guidance on the assessment of some of these risks. Excavation of these materials also involves as yet undefined operational and materials handling problems that have the potential to substantially delay implementation of the remedy and/or prolong the duration of induced higher-risk conditions. USEPA also failed to consider the risk and implementability impacts of these problems.

3.2.1 Unassessed Risks

Pathways

Without excavation there is no direct pathway for exposures to the contaminated buried lagoon soils because they are currently under an average of 20 feet of debris. By excavating these soils, new pathways are created and the potential for exposures and subsequent risks increases dramatically. Among these new pathways are the potential for dissemination in the environment by surface water runoff, by enhanced infiltration of precipitation through the open excavation, and by fugitive dust aerosol generation. These mechanisms could increase the potential health risks associated with exposures to site surface water bodies, sediments, and previously uncontaminated soils and air.

Figure 1 compares the number of exposure pathways associated with implementation of each remedial alternative. The figure shows that excavation and incineration alternatives create four additional pathways, doubling the number of potential exposure routes. Although the amount of risk posed by each pathway may vary, in general, the greater the number of pathways, the greater the risk of implementing the alternative.

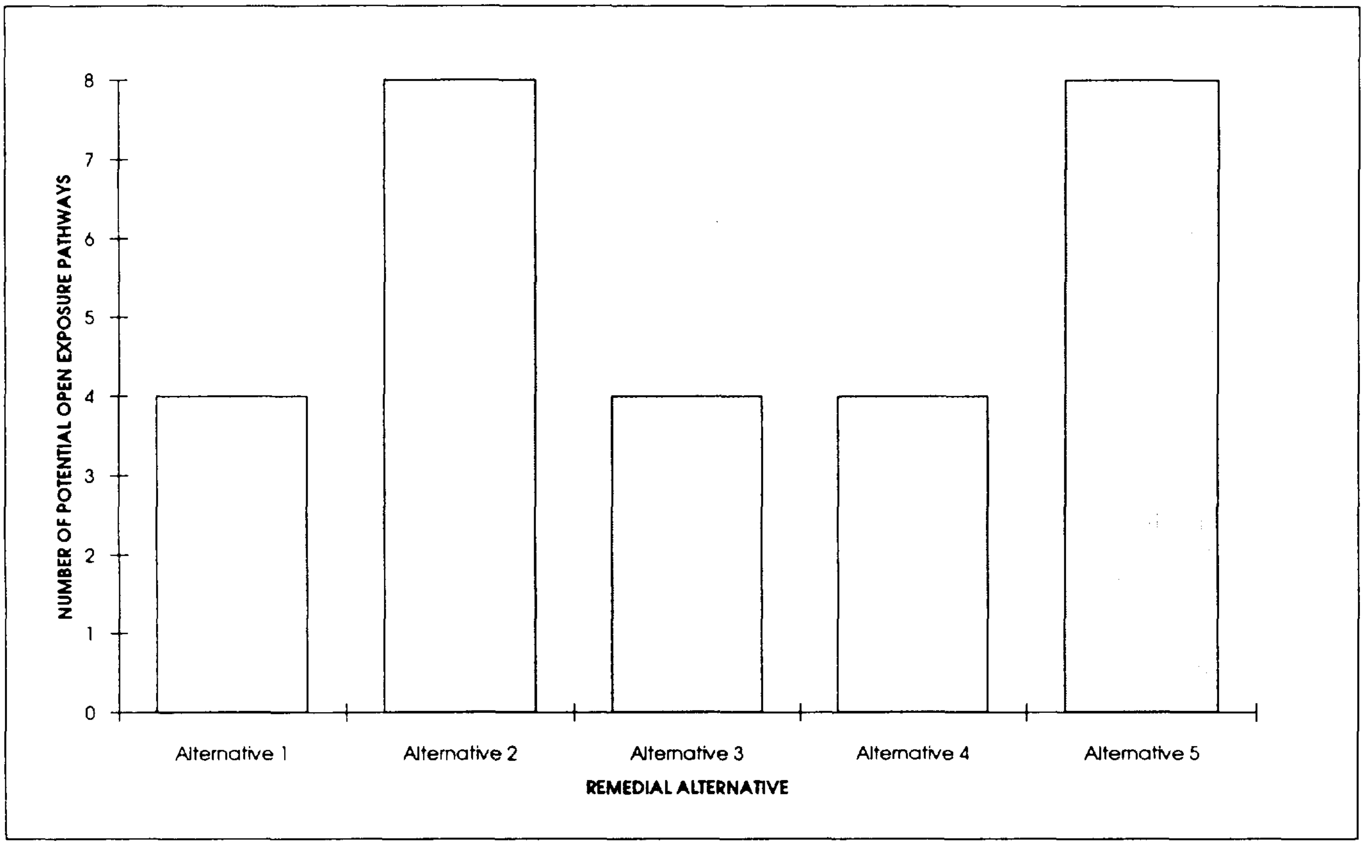
Risk Factors

In addition to creating new pathways, excavation of the buried lagoon soils could expose remedial workers and the surrounding community to a variety of new physical, biological, and nuisance hazards. The RI reports identified a number of organic and inorganic chemicals in these soils, and noted that nerve gas, mustard gas, incendiary bombs, phosphorus, flame throwers, cyanide ash, and explosive devices were reported to have been buried in the landfill. In addition, methane gas and biohazards (i.e., pathogenic bacteria/yeasts) are often associated with sanitary landfills. Excavation of the buried lagoon soils will necessarily involve several hazards associated with these materials including explosivity, flammability, combustibility, infectious diseases, chemical toxicity, nuisance odors, and fugitive dust generation.

Figure 2 compares the number of potential risk factors associated with each alternative. It is clear that the capping alternatives provide significantly fewer potential risk factors to workers and the surrounding community. In fact, the no action alternative poses fewer potential risk factors than the incineration alternatives. The excavation of buried lagoon materials followed by on site incineration results in the greatest number of potential risk factors due to the diverse and heterogeneous nature of materials found on site.

FIGURE 1

COMPARISON OF THE NUMBER OF POTENTIAL EXPOSURE PATHWAYS ASSOCIATED WITH EACH REMEDIAL ALTERNATIVE DURING IMPLEMETATION



Alternatives

1 - No Action

2 - Excavation and on site incineration of the buried lagoon; capping of the incineration residuals and the landfill.

3 - Capping of the buried lagoon and landfill with "RCRA multi-media" cap.

4 - Capping of the buried lagoon and landfill with "Ohio solid waste" cap.

5 - Excavation and on site incineration of the buried lagoon; capping of the incineration residuals and the landfill. treatment of VOC-contaminated subsurface lagoon soils with soil vapor extraction.

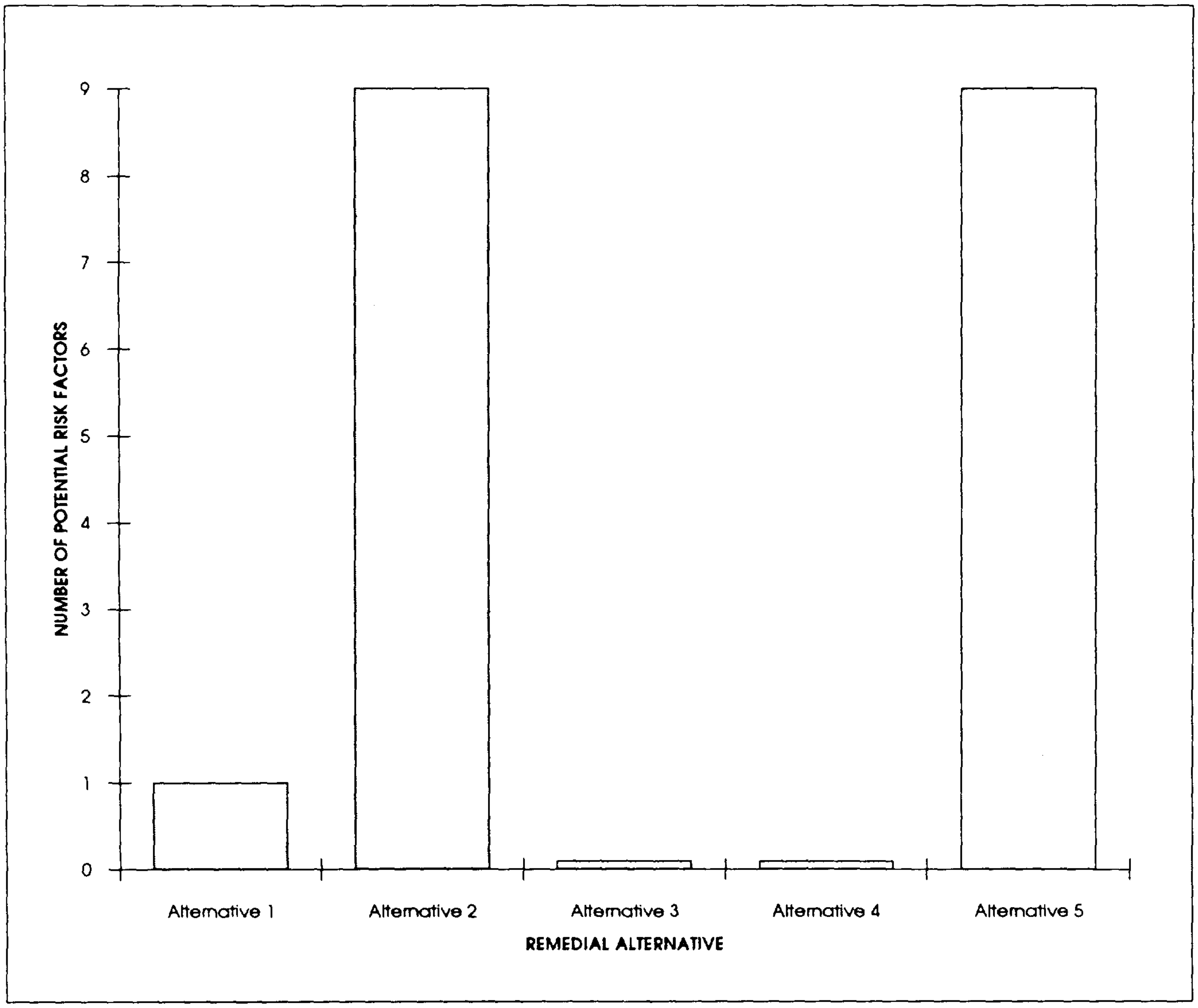
Potential Pathways

1. Soil Ingestion/Dermal Contact
2. GW Ingestion
3. GW Household Use (Dermal contact, vapor inhalation)
4. Surface Water&Sediment Ingestion/Dermal Contact
5. Inhalation of Vapors
6. Inhalation of Particulates
7. Ingestion/Dermal Contact with settled ash-contaminated soils
8. Ingestion/Dermal Contact with settled ash-contaminated surface water and sediment

Note: Exposure pathways 1-8 correspond to the respective areas on the above bar graph Y-axis.

FIGURE 2

COMPARISON OF THE NUMBER OF POTENTIAL RISK FACTORS
ASSOCIATED WITH EACH REMEDIAL ALTERNATIVE



Alternatives
1 - No Action
2 - Excavation and on site incineration of the buried lagoon;
capping of the incineration residuals and the landfill.
3 - Capping of the buried lagoon and landfill with "RCRA multi-media" cap.
4 - Capping of the buried lagoon and landfill with "Ohio solid waste" cap.
5 - Excavation and on site incineration of the buried lagoon;
capping of the incineration residuals and the landfill.
treatment of VOC-contaminated subsurface lagoon soils with soil vapor extraction.

Potential Risk Factors
1. Chemical toxicity *
2. Explosivity *
3. Emissions
4. Fire/explosion from methane
5. Flammability/combustibility *
6. Particulates
7. Pathogenic microbes *
8. Noise
9. Odor

* Indicates that chemical, biological and incendiary devices are included.

Note: Risk factors 1-9 correspond to the respective areas on the above bar graph Y-axis.

Qualitative Risk Comparison

A qualitative comparison of the relative risk among USEPA's alternatives can be made by considering the number of chemical, physical, biological, and nuisance risk factors associated with each alternative and the time required to complete it (Figure 3). For the purposes of this comparison, each potential risk factor was weighted to reflect its relative risk. For the existing site conditions, the only associated risk factor is chemical toxicity. This factor was given a weight of 4, and the remaining risk factors were each assigned a weight based on their expected relative risk magnitude when compared with chemical toxicity. The total weighted risk for all of the risk factors is 20.

The capping alternatives remove the chemical toxicity risk factor over the estimated 6 months required for construction without involving any other risk factors. Unlike the capping alternatives, the excavation/incineration alternatives show no reduction of risk for 42 months during the time required for permitting, test burns, reviews, and system modifications. Once excavation and incineration begin, the number of potential risk factors increases. These elevated risk factors would remain constant until incineration is completed, a period estimated to be as much as an additional 24 months. As the incinerator was then decommissioned over a 6 month period, risk would be reduced to a low residual level. Thus, incineration would require at least 66 months more than capping to reach the same residual risk level.

The relative risks associated with each alternative can also be evaluated by comparing the amount of time a population at risk may be potentially exposed to the various risk factors associated with completing the various phases of each alternative. This can be estimated by integrating the risk levels over time (i.e., summing the "number of months" x "weighted risk" for each phase of implementation). For example, the "total potential exposure months" for Alternative 1 are the number of months (78) times the weighted risk (4) or 312. Essentially, this evaluation compares the area under the risk-lines shown in Figure 3.

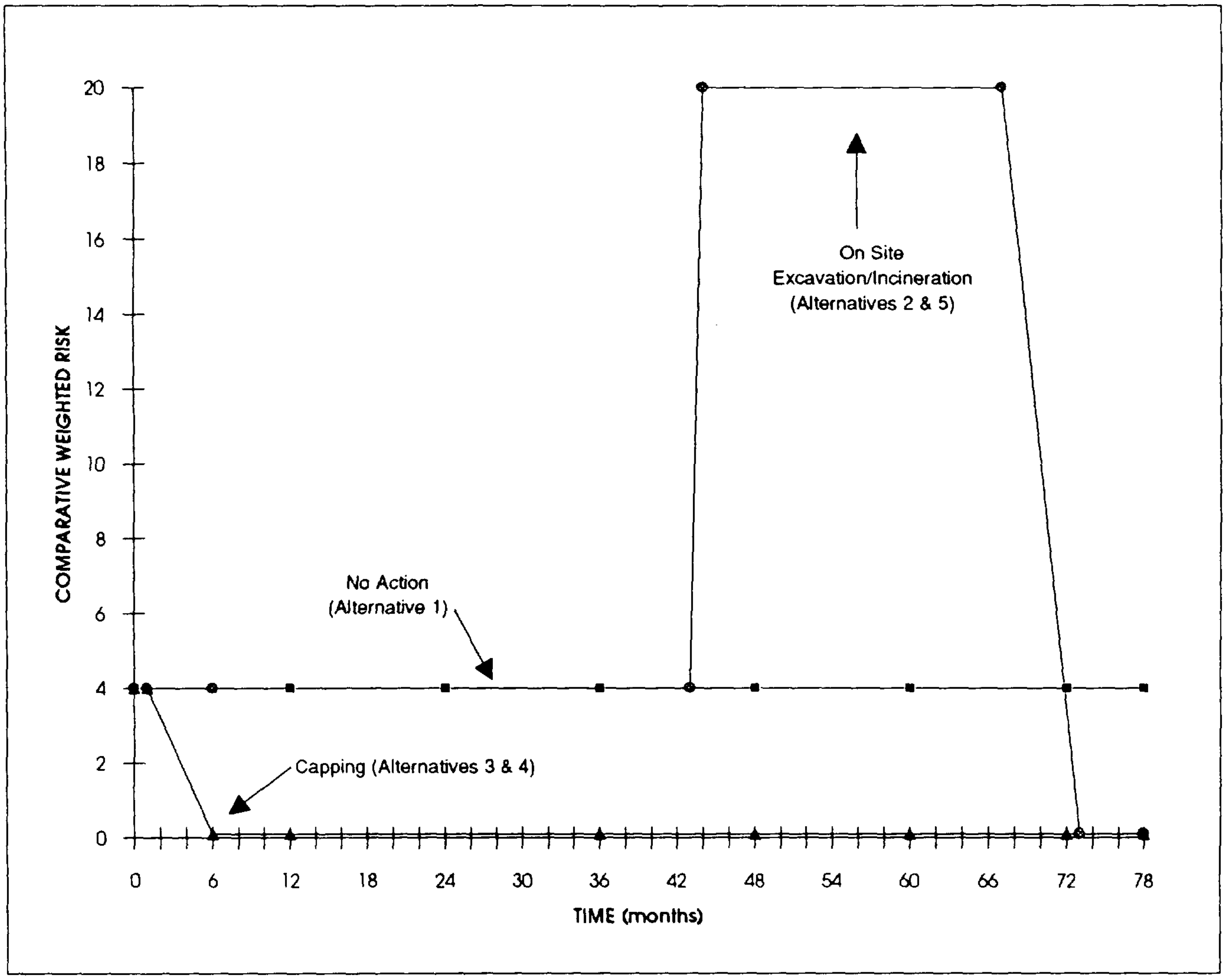
The results of this evaluation are presented in Figure 4, further illustrating that excavation and incineration alternatives present significantly greater total potential exposure than the capping alternatives. This is due to the creation of new exposure pathways, the resultant elevated number of weighted risks, and the increased time to implement incineration. This analysis did not consider the effects of potential operations delays, or the possibility of only operating the incinerator during school vacations, as suggested by USEPA during the July 29, 1992 public meeting. Thus, there may be intentional as well as unintentional extensions to the schedule of the incineration alternatives, causing the heightened risks of implementation to be prolonged.

Consistency with Guidance

Although the Feasibility Study addressed the potential risk to workers and the neighboring community associated with volatilization of materials during excavation of the buried lagoon, it did not fully consider all of the potential risks, or the potential additive effects, in its selection of a preferred remedial alternative. For example, the Feasibility Study did not consider the risks due to the creation of particulate aerosols during excavation.

FIGURE 3

COMPARISON OF THE POTENTIAL WEIGHTED RISK ASSOCIATED WITH
EACH REMEDIAL ALTERNATIVE OVER THE REQUIRED IMPLEMENTATION TIMES



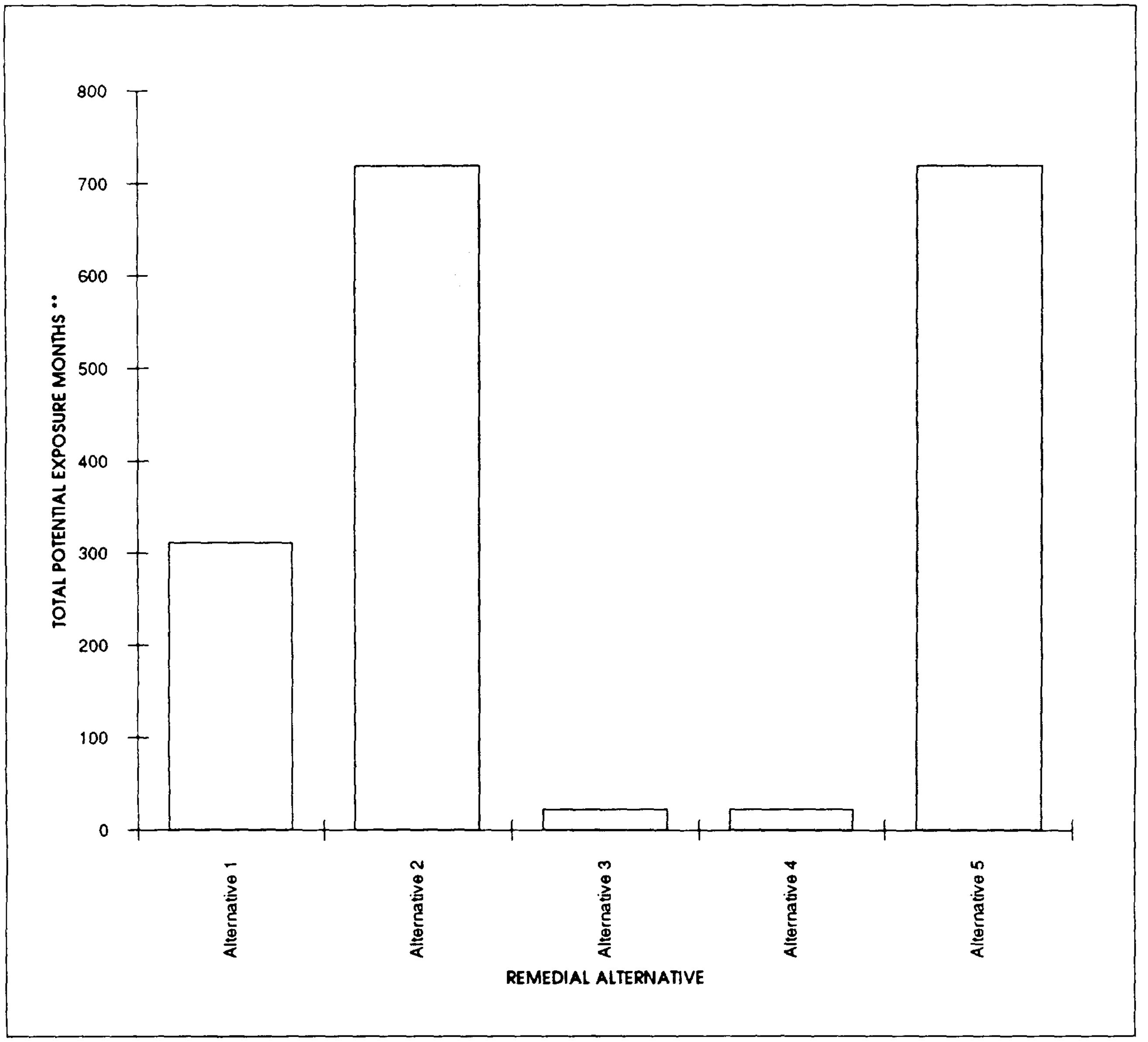
Potential Risk Factors	Factor Weights
1. Chemical toxicity *	4
2. Explosivity *	4
3. Emissions	3
4. Fire/explosion from methane	2
5. Flammability/combustibility *	2
6. Particulates	2
7. Pathogenic microbes *	1
8. Noise	1
9. Odor	1

* Indicates that chemical, biological and incendiary devices are included.

Note: The only risk factors associated with the the No Action Alternative (Alt. 1) is chemical toxicity (weighting factor of 4). All of the other risk factors are associated with excavation and on-site incineration (total weighted risk of 20).

FIGURE 4

COMPARISON OF THE TOTAL POTENTIAL EXPOSURE MONTHS **
ASSOCIATED WITH EACH REMEDIAL ALTERNATIVE
DURING IMPLEMENTATION



** Total Potential Exposure Months = an accumulation of the number of months a population at risk may be potentially exposed to the weighted risk associated with completing each remedial alternative (sum of: Months x Weighted Risk) (i.e., Fig. 3 area under curve).

Alternatives

1 - No Action
2 - Excavation and on site incineration of the buried lagoon;
capping of the incineration residuals and the landfill.
3 - Capping of the buried lagoon and landfill with "RCRA multi-media" cap.
4 - Capping of the buried lagoon and landfill with "Ohio solid waste" cap.
5 - Excavation and on site incineration of the buried lagoon;
capping of the incineration residuals and the landfill.
treatment of VOC-contaminated subsurface lagoon soils with soil vapor extraction.

Many of the contaminants present in these soils tend to be adsorbed to the soil particles and will not readily volatilize. As buried lagoon soils are excavated and transported to on-site or off-site locations, fugitive dust aerosols may be created. The risks associated with these fugitive dust aerosols may be significant, especially when combined with risks due to volatilization.

USEPA has a number of guidance methodologies to be used in estimating the risks from fugitive dust aerosols [Compilation of Air Pollutant Emission Factors, Vol. I, Stationary Point and Area Sources, 4th Ed., Office of Research and Development, 1985; Superfund Exposure Assessment Manual, 1988 (EPA/540/1-88/001); Air Superfund National Technical Guidance Series, Vol. IV, Procedures for Dispersion Modeling and Air Monitoring for Superfund Air Pathway Analysis, Interim Final, 1989 (EPA/450/1-89/004)]. Apparently, these documents were not used in the Feasibility Study, which is therefore inconsistent with available and appropriate guidance.

3.2.2 Potential for Delays and Prolonged Risks

From the operational and materials handling perspectives, a number of situations could develop that would cause substantial delays during excavation of the buried lagoon materials resulting in greater potential risk. Delays could be caused by unexpected conditions during removal of the demolition debris, by unexpected situations for which health and safety precautions have not been prepared, and by unexpected schedule coordination problems with the actual burning of the soils in the incinerator.

USEPA has estimated that 40,800 cubic yards of demolition debris overlying the buried lagoon materials will need to be removed, shredded, and subsequently placed beneath the final cap. This material potentially includes large pieces of reinforced concrete, asphalt, roofing shingles, wires and cables, lumber, dry wall, grass clippings, brush, and a wide variety of metal objects. The extremely diverse nature of this material makes proper selection and sizing of excavation equipment difficult. On the one hand, the excavation contractor may experience delays because he does not have the proper equipment to perform the work at the site; and on the other hand, he may have unnecessary pieces of equipment on site thereby wastefully increasing the cost of remediation.

In the event that unknown materials are encountered which cannot be incinerated (i.e. explosive wastes or non-combustible hazardous wastes), lengthy delays and substantial cost over runs can be expected. The excavation of such materials would need to be performed carefully by an experienced contractor under strict health and safety conditions. Significant time could be lost due to the need to procure and mobilize an acceptable contractor as well as to painstakingly proceed with the excavation.

USEPA has assumed that the bulk of the excavation work will be performed with minimal health and safety protection using conventional excavation techniques. However, due to the diverse and heterogeneous nature of the waste, this assumption could be unrealistic, resulting in an emergency situation for which the contractor is not properly prepared. Furthermore, in the event materials are encountered which necessitate modifications to the method of excavation and level of health and safety protection, the duration and cost of excavation would be greatly increased.

Delays may also be encountered in matching the production schedule of the excavation work with the production schedule of incineration. Excavation activities need to be carefully coordinated with incineration start up and operation to minimize the need for stockpiling, and rehandling of soil. Failure to carefully coordinate these activities will result in the excavation being kept open for an extended period of time. In the event of incinerator shut down, it may be necessary to temporarily suspend excavation activities or stockpile excavated material elsewhere on site.

3.3 Other Problems with Incineration

The incineration alternatives have several other problems in addition to those associated with excavation of the buried lagoon materials. The RI/FS did not provide the data needed to identify the most appropriate incineration technology, if any, and its associated operational constraints. The potentially significant scheduling impacts of the permitting process were not fully acknowledged, nor were the risks or incineration and the potential for operational delays to prolong these risks. In addition, USEPA has overstated the permanence of its incineration alternatives and understated the likely costs.

Off-site incineration, which was screened out as an alternative by USEPA, has all the disadvantages inherent to on-site incineration because it would still involve excavating and handling the wastes and impacted soils. Off-site incineration would have additional disadvantages associated with staging materials and loading long haul vehicles. Existing commercial incinerator facilities that could accept wastes from the site have current backlogs of two to three years, and the potential volume of waste from the site is large relative to their operating capacities. Thus, there could be delays both with initiation of an off-site remedy as well as during its implementation. Transportation of the wastes from the site would present additional risks and potential impacts because the waste material will need to be hauled through residential areas and in close proximity to the Union Valley elementary school. Vehicular accidents could result in the release of waste materials to the environment. Off-site incineration alternatives would also require the development of an Emergency Response Plan to address these potential risk as required by SARA Title III

3.3.1 Technology Selection

Based on a review of Records of Decision for similar CERCLA sites in the Midwest, on-site incineration as the selected remedy for hazardous waste sites has not gained wide acceptance due to the inherent problems in siting, permitting, constructing, and operating incineration systems. This is particularly true of waste sites with a wide variety of wastes such as the Skinner site. On-site incineration technology has been successfully employed at sites with well defined, uniform wastes. Such is the case with the use of low temperature thermal desorption technology for the management of petroleum contaminated soil. However, given the uncertainties caused by the diverse and heterogeneous nature of the waste materials at the Skinner Landfill site, it is not possible to properly evaluate the incinerator option or associated adverse impacts.

Effective production operation of an incinerator requires that the materials being fed into the incinerator be uniform. This is generally achieved by handling and processing the wastes between excavation and incineration. These activities could include screening the waste materials to obtain consistent size characteristics and the addition of bulking agents or other materials to improve the handling properties of the waste. In addition, different incineration technologies are better suited to treating wastes having specific physical and chemical characteristics.

Despite these constraints on effective operation of an incinerator, the existing characterization of the waste materials includes no information about the size range and/or composition of the "particles" that are to be incinerated. The Feasibility Study did not include any information regarding the physical properties that will affect handling (e.g., cohesiveness, stickiness, liquid content, etc.) In addition, the anticipated ash characteristics (including metals content) have not been assessed. Without this information, it is not possible to select appropriate equipment for preparing the wastes for incineration, nor is it possible to select the most cost-effective incineration technology.

The data presented in the Feasibility Study and the waste characterizations performed are inadequate for developing an incinerator permit application and to predict and evaluate the potential environmental impacts posed by the operation of the incinerator, its emissions, or its operating efficiency. The Feasibility Study acknowledges the potential for encountering wastes which cannot be incinerated, which will necessitate special provisions for separate handling and disposing of these problem wastes at off-site permitted disposal facilities.

Because the concentrations of hazardous constituents in the incineration feed cannot be predicted, it is not possible to properly assess the design and anticipated operating efficiency of an incineration unit. The Feasibility Study estimates that more than 20,000 cubic yards of material require incineration. However, due to the limited characterization of the waste mass and underlying soils in the RI/FS, the quantity of waste and contaminated soil to be incinerated could be significantly greater, increasing costs and implementation times.

At the July 29, 1992 public meeting, USEPA apparently proposed that the on-site incinerator would only operate during the school vacation. This approach poses very significant operational problems. First, effective length of the vacation period in this school district is no more than twelve weeks, of which perhaps two weeks up-front and two weeks at the end would be needed for mobilization and demobilization. This would leave only eight weeks for productive operation of the incinerator. Because the Feasibility Study likely underestimated the volume of material that might be incinerated and because it likely overestimated the production efficiency, incinerator operations could require as much as 15 years to complete.

The vacation-only approach would also be very cost-inefficient. First, there would be the unproductive costs associated with repeated mobilizations and demobilizations. Second, it is unlikely that a contractor would be willing to bring an incinerator on site and have it be idle for nearly 85 percent of each year without seeking some compensation for the down-time.

With respect to off-site incineration, the technology problem takes the form of a general shortage of commercial incinerator capacity. The closest facility that could accept wastes from the Skinner site is about 250 miles away in Grafton, Ohio, southwest of Cleveland. The next closest facilities are about 350 miles away in Sauget, Illinois, near St. Louis, or about 750 miles away in Baton Rouge, Louisiana, or in Coffeyville, Kansas.

All of these facilities have current backlogs extending for two to three years in the future, and the potential volume of waste from the Skinner site is large relative to their operating capacities. Thus, it would be difficult to secure adequate off-site disposal capacity for the Skinner wastes and to schedule for the timely removal, transportation, and disposal of waste and soil. In addition, off-site incineration is expensive. Current commercial incineration prices vary between $1,500 and $2,000 per ton, not including transportation, and these costs are likely to increase in the years ahead.

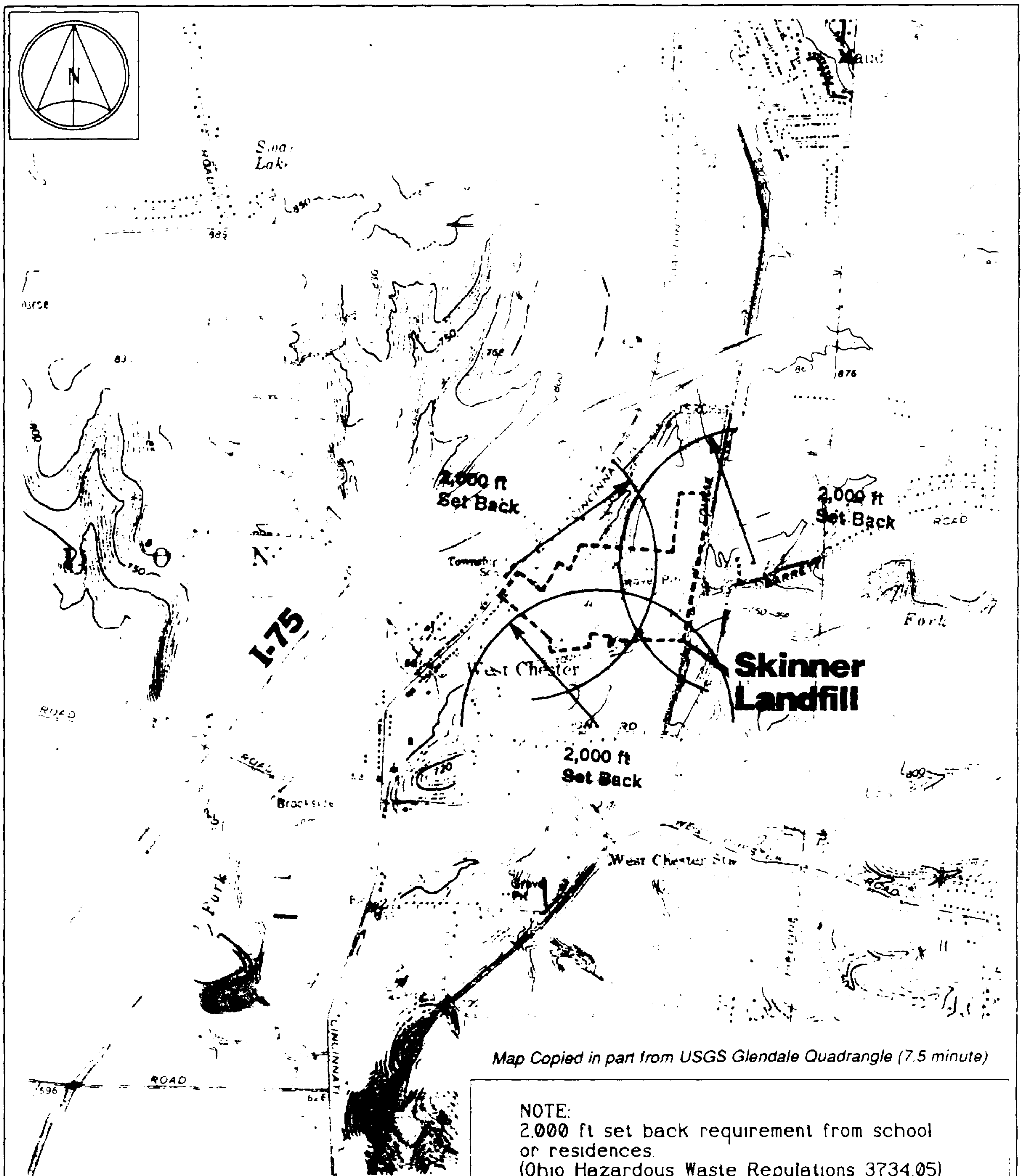
3.3.2 Permitting

Ohio Solid Waste regulations and USEPA RCRA regulations set forth requirements for the siting, design, permitting, construction, and operation of hazardous waste incinerators. The existing technical reports lack significant information that must be evaluated to comply with these requirements. USEPA proposes to gather this additional data in a series of small studies as implementation of the remedy proceeds. Given the nature and extent of these unknowns, there is a significant chance that this approach will result in multiple delays and substantial cost increases.

Of significant concern are the siting requirements of the Ohio solid waste regulations (Section 3734.05) which provide that a separation of 2,000 feet must be maintained between a hazardous waste incinerator and the nearest school or residence. This criterion can not be met at the Skinner Landfill because there is no area on the site where the set-back requirement can be satisfied (Figure 5). Although neither USEPA nor Ohio EPA have provided justification for avoiding the set-back requirement, it is possible that a variance may be obtained.

If on-site incineration is performed and the incinerator is sited as far as possible from residences and schools, its location would not be adjacent to the buried lagoon. As such, multiple handling of the wastes would be needed as the materials are excavated, screened and processed, temporarily stored near the excavation, loaded and transported to the incinerator location, and temporarily stored before burning. Each of these handling steps would increase the opportunity for exposures and increase costs.

Ohio regulations also provide for a comprehensive permitting process which includes detailed requirements for a test burn and system refinement. Complying with the substantive requirements of this process could easily take two to three years. Based upon public comment presented at the May 20, 1992 public meeting, it is clear that the public will oppose any alternative which is likely to cause delays in completing the remedy.



Map Copied in part from USGS Glendale Quadrangle (7.5 minute)

NOTE:
2,000 ft set back requirement from school or residences.
(Ohio Hazardous Waste Regulations 3734.05)

DUNN CORPORATION
1333 Butterfield Rd., Suite 540
Downers Grove, IL 60515-5610

FIGURE 5

INCINERATOR SET BACK DISTANCE

Skinner Landfill
West Chester, Ohio

PROJECT NO: 80197-00439

Scale: 1" = 2000' (approx)

With respect to off-site incineration, permitted commercial incinerators have very rigid material acceptance criteria which would require rigorous and detailed testing of each load of waste and soil delivered to the off site incinerator. In addition, commercial incinerators operate under strict state and federal permits many of which prohibit the acceptance of a wide range of waste materials. Unless the waste mass and soils are thoroughly characterized, it would be difficult if not impossible to enter into a contract for off-site incineration.

3.3.3 Risks and Delays

The on-site incineration of soils will result in unnecessary risks to human health by creating new potential risks, increasing existing potential risks, and creating nuisance noise and odors. The incinerator itself will create a significant amount of noise while it is running, thereby creating a potential hazard to remedial workers and a unacceptable nuisance to individuals in surrounding communities. The odors and emissions released during excavation of soils may also create hazards to workers and nearby residents. In addition, adverse reactions to odorous pollutants can be more that a nuisance or annoyance. Odorous substances can produce physiological responses which were not considered during the selection of the remedial alternative.

Although the incineration process is predicted to be extremely efficient, there could be volatiles, particulate pollutants (e.g., metals), and a variety of combustion products in the emission stream during start-up and in the event of a malfunction. The potential health effects from inhalation exposures to these materials is uncertain. Although these materials would be released to the ambient air, soil or water could also be impacted by natural deposition mechanisms. Therefore, potential health risks via direct inhalation, ingestion of impacted food chain and water supplies, as well as direct contact with soil or water are a concern. None of these risks have been addressed by the USEPA's technical reports.

During delays in the incineration process it will be necessary to stockpile soils on site. This practice will increase existing risks as discussed above since the potential for direct contact with the more heavily impacted soils would increase dramatically. This will result in increased risks to workers and area residents. Increased risks due to elevated levels of contamination in various media may occur as a result of surface water run-off and fugitive dust aerosol generation from the now-exposed impacted soils.

With respect to off-site incineration, there would likely be substantial difficulty in scheduling and coordinating the off-site management of the materials with the on-site excavation, staging, and stockpiling activities. There is the further problem that a load of material could fail the incinerator facility's acceptance criteria and be returned to the site. This could initiate a series of rolling delays in which the wastes would need to be re-characterized, the processing systems re-designed and re-built, and new permits obtained before the implementation of the remedy could resume. The implementation of an off-site remedy using the "vacation-only" operating approach proposed by USEPA during the July 29, 1992 public meeting would still have the effect of greatly extending the project schedule, and whole working seasons could be lost if waste acceptance or incinerator capacity problems arise.

3.3.4 Permanence

Incineration is not, in and of itself, a final disposal method because it is possible that some impacted soil will not be excavated because it may be infeasible to do so. Thus, one of the chief reasons for selecting incineration in spite of its considerably higher risks and incremental cost – that it would permanently destroy the wastes – is invalid. Furthermore, one of the primary objectives of treatment, which is to eliminate or minimize the need for long-term maintenance (40 CFR 300.430(g)(3)(i)), will not be achieved because the resulting ash will be landfilled at the site.

In addition, incineration produces an ash which must still be managed according to its characteristics. Because the incinerator feed has not been well characterized, it is not possible to predict the nature of the ash which would be produced. Nevertheless, the incineration alternatives proposed by USEPA include the stabilization of this ash and its burial on site. One of the consequences of this approach is that the volume of waste remaining on site after incineration would actually be greater than the existing waste volume. This situation results because the incineration of soil results in very little volume reduction. When stabilizing materials are added to the ash, the volume of waste becomes greater than the original volume of the soil.

A second consequence is that periodic CERCLA review of the site will still be necessary because waste materials will be left on site. Review of the NCP and related guidance shows that a primary reason for preferring and/or seeking permanence is to avoid the necessity of reviewing the performance and status of a remedy/site every five years. In this respect as well, the USEPA's recommended incineration alternative is not a permanent remedy because the landfill and the stabilized incineration ash will still be present on the site and the need for long-term site management will not be eliminated.

3.3.5 Cost Escalation

The costs for design of the incineration alternative estimated in the FS failed to include all site engineering design needs. Among the overlooked details are water supply, electric supply, natural gas supply, wastewater treatment design, wastewater discharge permitting, and foundation design. The costs associated with these design and permitting activities should have been itemized and included (OSWER Directive 9355.3-01, "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA", Interim Final, October 1988, Section 6.2.3.7). In addition, due to the limited characterization of the waste in the RI/FS, the true effort and estimated costs involved in permitting and carrying out the trial burn cannot be fully evaluated.

The cost estimate in the Feasibility Study did not include a decontamination and vehicle washing facility which will be needed because excavation equipment and haul vehicles will be entering an exclusion zone. The estimate also failed to provide for treatment of water collected during dewatering activities and equipment decontamination activities. The volume of collected water and associated treatment costs may be significant over the duration of excavation. Additionally, the cost estimate should have included the cost of treating the blow down water and particulates from the air emission control system.

According to USEPA's calculations, an estimated 40,800 cubic yards of construction demolition debris will need to be removed and processed prior to excavation of the waste and underlying soil. The estimated cost for this activity presented in the Feasibility Study is $1,290,000, or $31.62/cubic yard. Review of the assumptions made in the Feasibility Study shows that this estimate probably understates the true cost. It is likely that a 3-cubic-yard hydraulic excavator will not be able to handle the large pieces of reinforced concrete observed at the site. The need for additional equipment to remove the larger pieces of debris and the consequent greater costs should have been anticipated.

Also according to USEPA's calculations, an estimated 20,000 cubic yards of soil and waste would need to be excavated. It is possible that upon initiation of excavation work, the area of the actual excavation will be expanded. At present it is estimated that the incineration option will cost approximately $30,000,000, of which $3,000,000 (or $150/ton) is estimated as the actual operational cost of incinerating the soil and waste. If the volume of soil is significantly increased, there will be a commensurate increase in the operational cost of the incinerator.

The total incineration costs estimated by USEPA for engineering, construction, construction management, operations, maintenance, and contingencies are approximately $10,611,500, or approximately $530/cubic yard of soil incinerated. When the additional costs itemized above are included, the per cubic yard price will be significantly higher. As previously noted, USEPA's estimated cost does **not** include the additional cost of the off-site management of wastes which cannot be incinerated, or costs associated with excavation and management of explosive wastes. Revised cost estimates that account for this omission and for the omission and/or underestimation of quantities and unit costs shows that the actual costs of USEPA's incineration alternative is likely to be as much as $88.5 million (see Appendix B).

4.0 PRESENTATION OF THE APPROPRIATE REMEDY

An appropriate remedy (which combines features of several USEPA alternatives) would consist of the following elements: 1) a cap over the buried lagoon and active landfill areas; 2) soil vapor extraction beneath the buried lagoon, if feasible; 3) groundwater collection and treatment at the downgradient side of the potential source areas, if necessary; and 4) institutional controls (fencing, deed restrictions, and extension of public water supply).

4.1 Discussion of Capping

Placement of a cap over the buried lagoon and landfill materials will have several effects on the existing groundwater regime in this area of the site. The first effect will be to substantially reduce the infiltration of precipitation through the potential source materials. Based on the calculations presented in the Feasibility Study, a multi-media cap would reduce the volume of water infiltrating through the wastes by 99.9 percent. Since about 42 percent of precipitation is estimated to infiltrate through the waste under existing conditions, this means that less than one-twentieth of one percent of precipitation would infiltrate through the wastes after capping.

Thus, capping the buried lagoon and landfill materials eliminates the only currently active migration pathway with the potential to move contaminants away from the potential source areas and into other environmental media. In addition, the substantial reduction in recharge to the water table under the cap will cause a general lowering of the elevation of the water table in this area. Because the waste material is currently located above the water table, the lowering of groundwater levels will further isolate the waste materials from the groundwater by increasing the distance between the wastes and the water table. In addition, it will reduce hydraulic gradients in this part of the site, causing what appear to be very slow existing groundwater flow rates to become even slower.

In spite of these advantages, the Proposed Plan has arbitrarily selected incineration because it purportedly represents "permanent" treatment of the waste materials. In discussions concerning this issue, USEPA representatives stated that capping could not be considered permanent because a gully "might" erode through the cap **and the underlying demolition debris** and expose the buried lagoon materials at the surface to recreational users. If the Feasibility Study had included calculations of the expected erosion of the proposed cap designs, it would have determined that this scenario is improbable. The Feasibility Study did not include any calculation of this erosion.

Calculations of potential erosion from the USEPA's proposed caps were made in the course of preparing this technical comment document. Using the Unified Soil Loss Equation (USEPA's preferred method for evaluating erosion on landfill caps) and the landfill cap design presented in the Feasibility Study, the calculated annual soil loss due to erosion of the cap is 0.43 tons per acre per year, well below the USEPA's recommended limit of 2.0 tons per acre per year. Furthermore, based on the very low number calculated, sheetwash erosion -- rather than rill and gully erosion -- is indicated. Spread across the landfill on a per acre basis, the calculated soil loss is equivalent to 0.0024 inches per year. At this rate it will take 8,300 years to erode through the upper 20-inch topsoil layer of the cap.

The underlying gravel and cobble layers of the drainage/biotic barrier will be significantly more resistant to erosion than the topsoil layer for two reasons. First, there will be very little flow along the surface of the exposed gravel because the water will percolate into the layer. Second, what little flow may occur along the top of the layer will not have sufficient power to erode gravel-sized particles. Clearly, the long-term effectiveness and practical permanence of a cap are equal to those of incineration, and the residual risks are essentially the same because there is no likelihood that the buried lagoon materials could be exposed by erosion.

4.2 Treatment of Source Materials

Although capping of the buried lagoon and active landfill will substantially limit the mobility of wastes present in these potential sources and has the potential to reduce the volume and toxicity of future impacts to groundwater, Region V does not consider capping to be treatment. Among alternatives that provide overall protection, meet ARARs, and are equivalent with respect to long-term effectiveness and permanence, the NCP establishes a preference for alternatives that include treatment **provided that such treatment is cost-effective**. By modifying selected features of USEPA's containment alternatives, it is possible to provide treatment of potential source materials at the Skinner site for essentially the same cost as USEPA's containment alternatives.

Thus, the appropriate remedy for the site includes vapor extraction from the natural soils beneath the buried lagoon materials and possible treatment of the effluent airstream. This element of the remedy would be implemented if it is determined to be technically feasible through field-scale pilot testing. Vapors, potentially containing VOCs from the buried lagoon materials, would be extracted from the natural soils beneath this potential source area. To avoid the problems inherent in drilling through the waste materials, the individual collection or air-supply pipes would be installed by drilling on an angle or horizontally from the western side of the hill that contains the buried lagoon. The results of field testing would be used to determine the appropriate number and spacing of pipes, flow rates and vacuum pressures, the need for and most appropriate treatment technology for the airstream, and other operating parameters.

4.3 Groundwater Collection and Treatment

In light of the previous discussion concerning the virtual absence of reliably detected contaminants in groundwater at the site, the automatic selection of the same groundwater collection and treatment in all action alternatives is arbitrary. The need for groundwater collection and treatment has not been established and may warrant further study. To establish on a reliable basis that groundwater is being impacted by the buried lagoon materials, additional groundwater monitoring would be needed. Only after repeated, consistent detections of the same compounds can a conclusion be made that the buried lagoon materials are impacting groundwater. Such study can make use of the existing monitor well system.

Even if impacts to groundwater are indicated by the Phase I and Phase II RI data, none of the risks currently posed by groundwater or any of the media receiving discharges from groundwater exceed the upper end of the USEPA's acceptable risk ranges (carcinogenic $>10^{-4}$; hazard index >1). Thus, the need for groundwater collection and treatment is doubtful because no actionable risk is present even after more than 15 years of uncontrolled infiltration of precipitation through the potential source materials without engineering controls to limit migration. The Baseline Risk Assessment based the future risks for this medium on the residential use of groundwater, which even the USEPA has admitted is an unlikely occurrence. However, there is simply no reason to believe that future risks will be any different from those under the current use conditions.

The preceding discussion shows that the RI/FS did not collect the data needed to conclude that groundwater collection and treatment are necessary. The degree to which the buried lagoon and landfill materials are impacting groundwater under current conditions, and the effects of placing the cap over these areas were not addressed. If future studies show that groundwater collection and treatment are appropriate, several additional studies would be needed to design these systems. The existing soil and rock conditions along the proposed collection system and the flow rate and chemical concentrations of the influent will need to be defined in substantially better detail. At a minimum, the proposed trench and slurry wall can be replaced with a partially lined trench.

Regardless of the results of any studies to determine whether groundwater contamination is being caused by the buried lagoon material or to assess the effects of the cap on the local groundwater flow regime, the Feasibility Study was arbitrary in selecting up-gradient groundwater diversion structures (slurry wall and drainage trench), the need for which are clearly not supported by the evidence. Because groundwater is not currently in contact with the buried lagoon materials, up-gradient water flowing under these materials can become contaminated only if there is recharge percolating through them. As discussed above, the infiltration of precipitation through the buried lagoon materials would be precluded by capping.

4.4 Effects of Institutional Controls

The implementation of institutional controls can provide significant and immediate reductions in health risks, preclude (admittedly unlikely) future health risks, and be responsive to a community concern. Because the unacceptable health risks currently existing at the site all require direct contact with contaminated soil materials in order to occur, fencing the areas containing such soil would substantially reduce these risks. Although USEPA may consider this a temporary or supplemental action, there is no doubt that fencing could severely limit (and possibly preclude) access to the site and provide a prompt response to a community concern.

Deed restrictions could be used to prevent future residential uses of the buried lagoon and landfill areas, precluding residential exposures to the buried lagoon materials and the drinking or household uses of site groundwater. USEPA representatives have stated publicly that even without formal action, future residential use of this area is unlikely because residential use is not considered an acceptable reuse of former waste disposal areas.

In addition, the existing residential use of the **property** is not the same thing as residential use of the contaminated site, a fact not acknowledged in the Baseline Risk Assessment or

Feasibility Study. The Remedial Investigation shows neither the presence of surface soil contamination in the residential areas of the property (i.e., in yards around houses), nor the presence of contaminated drinking water at these homes. Furthermore, there is a distance of nearly 1000 feet between the residential areas of the property and the areas used for waste disposal. Because the site should be defined as those areas containing wastes or contaminants, it is arbitrary and unsupported by the facts to conclude that there is residential use of the site.

The possible impairment of several private water supplies was raised in the May 20, 1992 public hearing as a community concern even though USEPA concluded that drinking water supplies or resources were not endangered by the site.

> *"In summary, essentially no impact to area residential wells was observed in the samples collected." (pg. 80)* and *"The results of the Phase II Remedial Investigation indicate that there is limited potential for significant off-site migration of contaminants from the Skinner site." (pg. 103)*

Nevertheless, by connecting potentially affected residences to the available public drinking water supply, a prompt response to community concern can be provided. Together, these institutional controls can prevent or severely limit all current potential exposures and subsequent health risks related to media of concern (Table 1). These controls can be implemented immediately with only a minimum of financial resources.

4.5 Evaluation of the Appropriate Remedy

The remedy presented above should have been selected for the Skinner Landfill because it is more protective of human health than incineration (because it avoids the substantial potential short-term risks posed by excavation); meets chemical- and action-specific ARARs to the same degree as incineration; meets location-specific ARARs to a greater degree than incineration; is as effective in the long-term and as permanent as incineration; reduces contaminant mobility, toxicity, and volume through treatment of soil and groundwater (if necessary) to a greater degree than containment alone; is more effective in the short-term than incineration; is more readily implemented than incineration; is less costly than incineration and no more costly than containment only; and (based on comments made during the May 20, 1992 and July 29, 1992 public meetings) is likely to have greater public acceptance than incineration.

TABLE 1

SUMMARY OF POTENTIAL EXPOSURE PATHWAYS FOR SKINNER LANDFILL SITE AFTER IMPLEMENTING INSTITUTIONAL CONTROLS

Exposure Route, Medium and Exposure Point	Residential Scenarios		Occupational Scenarios		Recreational Scenarios	
	Pathway Selected	Justification	Pathway Selected	Justification	Pathway Selected	Justification
Soil Ingestion/Dermal Contact						
Future Use	No	Fence/deed restrictions	Yes	Workers on site	Yes/No	Fence: very limited exposure if any
Inhalation of Vapors/Particulates						
Future Use	No	Contaminated soils deep. Fence/deed restrictions	No	Contaminated soils deep	No	Contaminated soils deep. Fence/deed restrictions
Groundwater Ingestion						
Future Use	No	Public water supply	No	Public water supply	No	Public water supply
Groundwater Household Use						
Future Use	No	Public water supply	No	Public water supply	No	Public water supply
Surface Water and Sediment Ingestion and Dermal Contact						
Future Use	No	Exposures recreational in nature	Yes	On site creeks and ponds	Yes/No	Fence: very limited exposure if any
Ingestion of Contaminated Food						
Future Use	No	Deed restricitons	No	Deed restricitons	No	Fence, nature of area

5.0 CONCLUSIONS

Technical evaluation of the USEPA's Proposed Plan, the Phase I and Phase II Remedial Investigation Reports, the Baseline Risk Assessment, and the Feasibility Study shows that the existing documents are not adequate to support the selection of an incineration alternative. These documents did not appropriately consider the significant difficulties of implementing an incineration alternative, nor did they appropriately consider all of the potential risks associated with incineration alternatives. The risk evaluation of these alternatives presented in the USEPA documents is cursory and does not include several significant pathways and impacts caused by excavation of buried wastes.

USEPA's data on the extent of contamination emanating from the buried lagoon materials shows that the **actual** migration of contaminants is limited to the immediate vicinity of the buried lagoon, even after more than 15 years of uncontrolled infiltration of precipitation through the potential source materials without any engineered controls to limit migration. After correcting for several errors, the peak risks presented by the existing site conditions are found to be two orders of magnitude lower than those calculated by USEPA, and only slightly higher than the upper limit of the "acceptable risk" range. The remaining existing risks are further reduced by the elimination of pathways that accompanies fencing, deed restrictions, and the extension of public water supplies.

An appropriate remedy (which combines features of several USEPA alternatives) would consist of the following elements: 1) a cap over the buried lagoon and active landfill areas; 2) soil vapor extraction beneath the buried lagoon, if feasible; 3) groundwater collection and treatment at the downgradient side of the potential source areas, if necessary; and 4) institutional controls (fencing, deed restrictions, and extension of public water supply).

With the implementation of a capping alternative, the need for upgradient groundwater diversion is eliminated. The buried lagoon materials are located above the water table, and groundwater levels will further decline with time as recharge is diverted by the cap. In addition, the need for groundwater collection and treatment has not been established. With recharge through the waste materials substantially eliminated, there is no mechanism for impacting the groundwater, and any groundwater that may already be affected will purge itself with time.

The appropriate remedy should have been selected for the Skinner Landfill because it is more protective of human health than incineration (because it avoids the substantial potential risks posed by excavation); meets chemical- and action-specific ARARs to the same degree as incineration; meets location-specific ARARs to a greater degree than incineration; is as effective in the long-term and as permanent as incineration; reduces contaminant mobility, toxicity, and volume through treatment of soil and groundwater (if necessary) to a greater degree than containment alone; is more effective in the short-term than incineration; is more readily implemented than incineration; is less costly than incineration and no more costly than containment only; and (based on comments made during the May 20, 1992 and July 29, 1992 public meetings) is likely to have greater public acceptance than incineration.

Appendix A

Critiques of Technical Reports

CRITIQUE OF SKINNER LANDFILL
REMEDIAL INVESTIGATION REPORT

1. Topographic changes at the site between the initiation of RI and its completion (as documented in the different topographic maps in the Phase I and Phase II RI reports) occurred because the site owner was allowed to place additional demolition, construction, and landscaping debris and other fill materials over the buried lagoon and on the "active landfill" *during* the RI.

   The extra material over the buried lagoon caused extra drilling and related costs to be incurred during the Phase II RI. In addition, in its selected alternative, USEPA estimated that $1.3 million would be incurred during the remedial action for moving the debris material overlying the buried lagoon. Neither of these costs would have to be incurred if the Agency had appropriately controlled the owner's activities at the site.

2. The methods used for characterization of the buried waste lagoon were not appropriately chosen based on accepted scientific and engineering practice:

   2.1 The location of the buried lagoon determined "from aerial photographs" as shown on Fig 2.4, 5.6 of the Phase II RI report is incorrect as clearly shown by other data obtained during study.

   2.2 The large spatial extent and allegedly high concentrations of contamination beneath the buried waste lagoon are largely based on soil gas readings which may not correspond to concentration of contaminants adsorbed to immediately adjacent soils.

   2.3 Furthermore, it is not accepted scientific and engineering practice to use vapor readings from an OVA, an OVM and an HNu interchangeably because they are designed to detect different materials. The OVA senses methane and the HNu senses hydrogen sulfide, but not vice versa.

   2.4 Because an OVA was used for some of the readings, methane, rather than a solvent, could be the reason for some of the high OVA readings.

   2.5 Because of its original nature, the former lagoon ought to behave as a somewhat homogeneous source over its former extent. Any impact actually caused by the lagoon ought to have a spatial pattern consistent with the distribution of contaminants in the source and subsequent migration. However, no effort has been made to contour the spatial distribution of specific contaminants either in the buried lagoon soils or in "down-migration" media. Thus, any conclusions about whether the buried lagoon is actually the source of contamination found at another location on the site are speculative.

   2.6 Waste borings in the lagoon area (WL series) that did not hit "sticky" or "tarry" materials have sampling interval gaps at the depths where this material should have been encountered. Thus, it is possible that sticky and tarry materials are present throughout the extent of the former lagoon. Given the described nature of the "sticky" and "tarry" materials -- which remained on the augers even after the reverse rotation procedure used for abandonment -- it is very likely that they were carried down with the augers during advancement of the boring, potentially affecting subsequent vapor readings in soil samples.

3. The EPA has not properly characterized the site geology. The characterization of subsurface soil conditions is superficial and contains several errors:

   3.1 The descriptions of how the glacial soils were deposited and the resulting soil stratigraphy are simplistic, and may have led to inappropriate correlations between borings.

   3.2 The soil materials could have been better characterized (depositionally and in terms of permeability) and better correlated between borings if some grain size analyses had been performed.

   3.3 There are numerous instances where the geologic cross sections are inconsistent with each other, showing different soil materials at the same boring location (WL-05, WL-06, WL-08, WL-09, WL-10, WL-14).

   3.4 The geologic cross sections are also inconsistent with the top of bedrock map. The map shows a ridge between GW-20 and GW-28, but section B-B' shows a flat surface.

   3.5 In addition, the sections are described as "attempts" at correlation; as such, it is inappropriate to rely upon them to predict or characterize possible contaminant migration.

4. The EPA has not properly characterized the site hydrogeology or substantiated any claims that waste constituents are migrating away from the buried lagoon or landfill. Groundwater flow and contamination migration conditions are poorly and inconsistently characterized:

   4.1 The report takes moderately high permeabilities determined from slug tests and combines them with high apparent water table gradients to calculate rather rapid groundwater flow rates. However, the presence of high gradients in a groundwater flow system is most often an indication that the permeabilities are low. The combined result is low flow rates, not high flow rates as calculated in the report.

   4.2 In addition, if the groundwater flow rates were actually as high as those calculated in the report, there should be a broad area between the lagoon and the creek with significant impacts to groundwater, which there is not -- only the wells nearly adjacent to the lagoon show substantial impact. Thus, the absence of high flow rates is supported by the limited extent of impacts to groundwater.

4.3 EPA has not demonstrated that the "migrated" contaminants come from the alleged source. If a contaminant found in the groundwater has not been identified in the soils at the buried lagoon, a conclusion that its presence was caused by the wastes is arbitrary and unsupported by the evidence. Similarly, if the pesticides in GW-09 are from the lagoon, they should also be in GW-20 or GW-27, which are between the lagoon and GW-09 along the path of groundwater flow.

4.4 EPA has not demonstrated that the BETX components originate in the buried lagoon. Occurrences of BETX components as the sole contaminants in groundwater (or soil) could be due to spilled fuel from heavy equipment used in on-site landfilling operations and have nothing to do with the former hazardous waste disposal activities near the buried lagoon.

4.5 The only complete pathway at the site along which contaminants from the lagoon may move to an exposure point is via groundwater and its discharge to Mill Creek. However, based on the information presented in the Phase II RI report, the EPA has not demonstrated the need for a remedial action for site groundwater. In fact, the conclusions that summarize the existing on-site groundwater contamination presented in the Phase II RI report describe a very limited potential for off-site migration of contaminants via groundwater.

4.6 The only complete pathway of exposure from buried lagoon wastes is infiltration of precipitation, contamination of groundwater, and migration of groundwater to surface water. It is arbitrary and unsupported by the evidence to assume that exposures at any point along this pathway will be at the concentrations found at wells B-5 or GW-20, which are near the buried lagoon. In fact, current site conditions show very clearly that substantial attenuation is occurring as groundwater migrates toward Mill Creek. For example, analysis of leachate seeps LS-01 and LS-02, which are positioned between these wells and the creek, may represent what is actually migrating via this pathway.

5. There are numerous errors and inconsistencies concerning how the analytical data were handled in the RI and subsequently used in the risk assessment:

5.1 There were differences in validation methodology between Phase I and Phase II. Phase I used data only if it exceeded five times the concentration found in a related blank whereas Phase II used a screening factor of ten times. There is no discussion in the RI of how these differences were resolved when preparing the data summaries for the risk assessment.

5.2 In both Phase I and Phase II reports, numerous instances of problems with "introduced" contaminants are acknowledged, but there is no clear trail showing how these problems were handled in the RI summary tables or in the risk assessment.

5.3 There is no "data validation report" in the Phase II RI report, showing in detail how and why data were declared invalid.

5.4 In the Phase II RI, there were several instances where "valid" data showed the presence of contaminants in surface water or sediment that were subsequently determined not to be attributable to the site. It is not clear from the RI report how or whether this data was used in the risk assessment.

5.5 The groundwater contaminants reported from the Technical Assistance Team sampling comprise a significantly different suite of compounds than any other sampling event, and at concentrations significantly higher than any other sampling event. It is not clear 1) if these data were collected using accepted or approved procedure, or 2) how or whether these data were used in the risk assessment. At a minimum, such use would be very questionable based on the inability to clearly define where these samples were collected.

5.6 Comparison of four rounds of groundwater data showed only 9 of 156 compounds consistently reported at specific sampling locations. If a contaminant can not be consistently found, it is arbitrary and unsupported by the evidence to conclude that it is present at the site, or to conclude that it is a chemical of concern for the Baseline Risk Assessment.

5.7 In addition, it is not clear from the RI report how "single time" data were used in risk assessment. It is not appropriate to use a high concentration value from a single, inconsistent occurrence to determine risk in a way that assumes long-term exposure to that concentration.

CRITIQUE OF SKINNER LANDFILL
BASELINE RISK ASSESSMENT

1. The Baseline Risk Assessment was unfocused and is of questionable quality because it was not conducted in accordance with applicable Agency guidance, and did not conform to accepted scientific and engineering practice.

   1.1 The selection of chemicals of concern (COC) was incomplete because the mobility and fate, and concentration versus toxicity characteristics were ignored. In addition, the large number of COCs obscures the predominant risks by creating long lists and multi-page tables which must be managed during the risk assessment and evaluated by those trying to use the report.

   1.2 The exposure assessment was flawed because all of the exposure pathways were considered to be complete, despite areas in the text which acknowledged that some of the assumed exposures are *unrealistic*.

   1.3 The toxicity assessment portion of the risk assessment was essentially nonexistent. There was no discussion of target organ toxicity for each COC or of confidence in the toxicity factors utilized in the risk assessment.

   1.4 The Baseline Risk Assessment was inconsistent with the U.S. EPA's Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual, Part A - EPA, 1989, because there were no toxicity profiles as required.

   1.5 The risk characterization only partially discussed potential health risks. No true characterization of potential site risks was attempted since toxicity profiles were not used.

   1.6 The derivation of the toxicity factors used in the risk assessments were not provided, resulting in potential risk estimates which can not be viewed with any degree of certainty.

2. The methods used in the Identification of Chemicals of Potential Concern (Section 2.0) were incomplete and often inappropriate.

   2.1 Much of the data from Phase I investigations were ignored because the detection limits were not reported in the formal Phase I RI report. Ignoring these data, instead of retrieving the data from the laboratories' files and using one-half the sample quantitation limit for these non-detected values (as per the U.S. EPA guidance - EPA, 1989) results in overestimates of chemical concentrations and, therefore, potential site risks.

   2.2 The Phase I data tables did not report the results from "blank" samples. Therefore, outside contamination may have been responsible for any of the detected chemicals and chemical concentrations.

2.3 For the selection of COCs in groundwater, the data were inappropriately split into bedrock and unconsolidated wells. The Phase I bedrock data had no background samples while the Phase II data had only one background sample. Also, no background residential well data were available. Therefore, the background concentrations of potential COCs were not well characterized - potential seasonal fluctuations were also ignored.

2.4 The Baseline Risk Assessment was inconsistent with U.S. EPA's Assessment Guidance for Superfund, 1989, as a concentration versus toxicity screening was not performed to further reduce the number of COCs to a reasonable number. This method provides a manageable list of COCs which defines 99% of the site risks and prevents any distraction from predominant risks caused by the inclusion of a large number of COCs.

2.5 The Baseline Risk Assessment was inconsistent with U.S. EPA's Risk Assessment Guidance for Superfund, 1989, as the selection of COCs did not consider the mobility, persistence, and fate of individual chemicals. Therefore chemicals which may not be available for human contact may have been included in the risk assessment, and vice versa.

2.6 Although the frequency of detection was considered to be a major criteria for inclusion/exclusion of chemicals from the risk assessment, a large number of chemicals were included even though they were only detected in one or two samples. Therefore, their inclusion is questionable, and may result in exaggerated and unrealistic conclusions regarding potential site risks.

2.7 "Professional judgment" was often used to include a chemical in the risk assessment. Without any discussion concerning the chemicals toxicity (i.e., toxicity profiles) this method of COC selection is inappropriate.

3. The Exposure Scenarios and Exposure Point Concentration assumptions (Sections 3.1-3.5) were often unrealistic and inappropriate.

3.1 The EPA incorrectly assumed that all areas of the site will be developed for residential use in the future.

3.1.1 The presence of a formerly active landfill on the site, the public knowledge of site use, and the State's statutory prohibition of excavating such an area makes this is an unrealistic assumption (Ohio Rev. Code Sec. 3734.02(H).

3.1.2 It is stated on Page 42 that it is unlikely that the waste lagoon area will be used for residential purposes in the future since it is a formerly active landfill. Therefore, it is unrealistic to assume future residential use of this area (Page 50), particularly since digging in a landfill area is prohibited by State law.

3.1.3 The report states that it was assumed that no drinking water wells will be installed in the waste lagoon area in the future (Page 50). This is appropriate since it is a landfill, and since building in a landfill area is prohibited by State law. However, it is *inconsistent* with the assumption that this area will be used in the future for residential purposes.

3.2 The risk assessment only evaluated the reasonable maximally exposed individual (RME). In keeping with current EPA guidance (February 26, 1992 memo from F. Henry Habicht II, Deputy Administrator, Office of the Administrator to Assistant/Regional Administrators - Habicht, 1992) a mid-range risk assessment (average or median) should also be conducted in order to fully characterize the range of individual risks at Superfund sites.

3.3 In evaluating whether the air exposure pathway is complete, the text (Page 50) states that the soils of concern are at depths where volatilization will not likely occur and vegetation/ground cover precludes the generation of fugitive dust aerosols. These statements indicate that the pathway is incomplete and should not have been further discussed in the risk assessment since there is no available source or chemical release from a source (EPA, 1989).

3.4 The current and future food exposure pathway is incomplete and should not be considered in the risk assessment for the following reasons:

3.4.1 There are no vegetable gardens or agricultural areas on the site. Institutional controls would preclude these uses in the future.

3.4.2 The close proximity of the site to a school, day care, and residential areas indicate that hunting is unlikely to occur on the site.

3.4.3 No sport fish which are normally consumed were identified in site surface water bodies.

3.5 The groundwater exposure pathway does not provide a reasonable estimate of potential site risks. Page 53 states that the maximum detected concentration was used as the exposure point concentration used to evaluate groundwater exposures. This provides a "bounding estimate of risk" or "worst-case scenario" which along with other exposure assumptions produces the highest conceivable risk. As pointed out by the EPA, "the probability of an individual receiving this combination of events and conditions is usually small, and often so small that such a combination will not occur in a particular, actual population"(Habicht, 1992).

3.6 Current residential exposure to soils used an inappropriate exposure point concentration. The current on-site residences are located a great distance from the impacted soils. The exposure point concentration for this scenario should use only soils in the immediate vicinity of, or on, the residences. Exposures to any other site soil would be more of a recreational type (nonresidential) of exposure which would occur with significantly lower exposure frequency, etc.

3.7 The report does not indicate which soils data were used for current occupational exposure scenarios (Page 54).

3.8 The report states that two soil exposure point concentrations were used for future waste lagoon land use scenarios (i.e., residential and nonresidential). However, Table 3-5 only provides one future exposure point concentration.

3.9 The future residential use scenarios of the buried lagoon utilized all soils data from this area. Even if excavation of deeper soils were to occur under future residential use conditions, soils greater than approximately 10-15 feet deep would not be excavated under normal construction activities. Therefore, the deeper, more contaminated soils (located at depths greater than 20 feet) would not be brought to the surface to provide an exposure point.

3.10 The risk assessment was inconsistent when evaluating surface water and sediments.

3.10.1 Future surface water concentrations were estimated for Mill Creek, but not the other surface water bodies.

3.10.2 Future sediment concentrations were not estimated. If surface water is assumed to change over time, then sediments may also be altered.

3.11 The risk assessment data did not differentiate between the valence states of chromium. Therefore, all detected total chromium was assumed to be the more toxic hexavalent form. This assumption could lead to an extremely overestimated risk for chromium in soils. There should have been an attempt to differentiate between trivalent and hexavalent chromium.

4. The Estimation of Chemical Intakes (Section 3.6) often utilized inappropriate assumptions, thereby leading to erroneous estimations of intake and subsequent health risks.

4.1 The risk assessment states that it is utilizing the EPA default of a 30 year total residential and recreational exposure duration. The risk assessment should, therefore, have used an exposure duration (and a noncarcinogenic averaging time) of 6 years for the child and 24 years for the adult (total of 30 years).

4.2 In spite of the fact that the report states that EPA default values were utilized, estimates of the occupational exposure intakes were based on an exposure duration of 47 years, not the EPA default of 25 years (U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance: Standard

Default Exposure Factors, 1991 - EPA, 1991). This would also affect the noncarcinogenic averaging time.

4.3 The Baseline Risk Assessment is not consistent with EPA guidance (1991) for exposure frequency. The risk assessment assumed an exposure frequency of 365 days/year for residential soil and groundwater exposure intake estimates. Since people normally spend approximately two weeks away from home each year, the EPA has established a default exposure frequency for residential exposures to 350 days/year.

4.4 The skin to soil adherence factor was assumed to be 2.11 mg/cm^2. This assumption appears to be overly conservative since the EPA (1989) indicates that the factor is 1.45 mg/cm^2 for commercial potting soil, and was found to be 0.51 mg/cm^2 in a study of 2-6 year old children during the summer in Hartford, Connecticut (Lepow et al., Envision. Res. 7:99-102, 1974; Lepow et al., Envision. Res. 10:415-426, 1975).

4.5 Estimated exposure intakes of COCs in surface water and sediment were based on swimming exposures. This recreational exposure appears to be realistic for the ponds evaluated. However, "wading" appears to be the only realistic recreational activity for the relatively shallow creeks/brooks/intermittent streams evaluated in the risk assessment. This would dramatically affect the exposure duration, exposure time, exposure frequency, skin surface area, etc.

4.6 The Toxicity Assessment section (Section 4.0) of the risk assessment is totally inappropriate for fully characterizing potential health risks. The absence of toxicity profiles precludes a true characterization of potential risks for a number of reasons.

4.7 The appropriateness of the use of toxicity factors contained in the Health Effects Assessment Summary Tables (HEAST) can not be determined. HEAST data are not peer reviewed and may be incorrect or inappropriate. As pointed out by the EPA in the "Caution" statement in each edition of HEAST, the HEAST data "alone tell very little about the adverse effects of a chemical or the quality of evidence on which risk assessments are based". "The HEAST is structured to point the user to" the original source documents for a more complete characterization of risk.

4.8 Uncertainties and levels of confidence in the toxicity factors are not discussed, potentially exaggerating risks. An example would be the current scientific thinking that the carcinogenic potency of dioxins may be up to 100 times lower than the EPA slope factor. The EPA is currently reviewing the cancer risk assessment for dioxins.

4.9 Certain compounds effect specific organs in the body. Without knowledge of each chemical's target organ toxicity and toxicodynamics, assuming additivity for carcinogenic and noncarcinogenic effects can not be performed with any scientific basis. Nevertheless, the carcinogenic and noncarcinogenic effects for all chemicals of concern were added together in the Baseline Risk Assessment.

4.10 Toxicity factors derived by U.S. EPA's contractor can not be verified without a discussion of each chemical's toxicity characteristics. These derivations often produced unacceptable noncarcinogenic toxicity factors (reference dose - RfD) as pointed out by the ECAO. The use of unacceptable numbers is not better than no number at all since they may result in misleading risk characterization.

4.11 The authors often attempted to derive a RfD based on an acute LD_{50} value. This is totally inappropriate since:

4.11.1 The LD_{50} end-point is a fatality, not the on-set of cancer or illness.

4.11.2 The time required to achieve the LD_{50} end-point is largely unknown because it may have occurred at any point between 1 minute to 14 days postexposure.

4.11.3 The minimum database for derivation of a chronic RfD is a single, well documented study (EPA, 1989).

4.11.4 An uncertainty factor of 1,000,000 was often applied despite EPA guidance that an uncertainty factor of greater than 10,000 should never be used.

5. The improprieties in the first three phases of the risks assessment resulted in a Risk Characterization section (Section 5.0) which was incomplete and inaccurate as further outlined below.

5.1 The evaluation of potential cancer risks for children provides little insight into significant site risks. Since cancer is a lifetime risk, it would be more appropriate to evaluate potential risks to children and adults *combined,* using a total exposure duration of 30 years as discussed previously.

5.2 Residential exposures to buried lagoon soils will not likely occur, therefore, these risks should not even be expressed. The area is a formerly active landfill, the contaminated soils are largely at depths greater than 23 feet, and the potential presence of explosives makes excavation of these soils unlikely.

5.3 The inappropriateness of the exposure point assumptions for soils results in future residential risks which are less than current residential risks (refer to previous comments concerning residential exposures). Without modeling to account for natural degradation of chemicals in soil, this finding is not appropriate.

5.4 The uncertainties concerning the toxicity of dioxins should be discussed in order to fully characterize risks to soil.

5.5 The report states that in order to add noncarcinogenic risks for individual chemicals (hazard quotients), the compound must produce the same toxic effect by the same mechanism of action. Despite this statement and the absence of toxicity profiles, the report proceeds to sum the noncarcinogenic risks for all the COCs regardless of this constraint.

5.6 The swimming scenarios for Mill Creek and Skinner Creek are inappropriate. As discussed previously, wading activities would provide a more *reasonable* estimate of potential risks.

5.7 The current and future residential multiple exposure pathways total risks in Tables 5-45 and 5-46 are combining residential exposures via the buried lagoon *and* site-wide soils (along with other pathways). It is inappropriate to combine these 2 residential exposures since an individual can only reside in one area, not both. Exposure to solids in other areas of the site would be recreational in nature, not residential.

5.8 The uncertainties discussion does not mention the complete absence of toxicity profiles, the levels of confidence in toxicity factors, the data from which the toxicity factors were obtained, etc.

CRITIQUE OF SKINNER LANDFILL FEASIBILITY STUDY

1. The EPA has not demonstrated that the proposed remedial plan is consistent with the limited migration of contaminants and the relatively minor potential public health and environmental risks posed by the site. The remedial alternatives and the preferred remedy are extremely conservative and very much "overkill" considering the relatively minor public health and environmental risks posed by the site. Further, with the limited potential for migration of site derived chemicals, it appears that in situ methods and containment technologies should be emphasized.

2. The stated remedial objectives presented in Section 3.2 for each environmental media are extreme. This has skewed the evaluation and screening process away from a number of processes and technologies which are known to be effective. Section 3.4.2.1 incorrectly concludes that incineration is the only viable technology for effectively managing contaminated soils, and fails to evaluate the application of several technologies in combination with one another in order to achieve remedial objectives.

3. The ARARs and resultant remedial objectives are based upon the questionable, and in some cases unsubstantiated findings of the Remedial Investigation Report and Baseline Risk Assessment.

   A more reasonable view of the RI data, and a more reasonable assumption regarding the future use of the site, will yield a more realistic picture of the true public health and environmental risk associated with the site. The remedial objectives should be based accordingly.

4. In situ soil treatment technologies are rejected (Section 3.4.2.3) since "not <u>all</u> soil contaminants would be removed or immobilized" (emphases added). It is not necessary to remove all contaminants to effect an appropriate level of risk reduction.

5. The EPA's data to date does not demonstrate that groundwater collection/treatment is necessary. A more reasonable approach would be to cap the site while carefully monitoring groundwater and completing the RI database (see RI comments).

   Once the true impact to groundwater is known and the effectiveness of an impermeable landfill cover evaluated, the need for further groundwater collection/treatment could be considered.

6. The upgradient slurry wall is not necessary given the stated permeabilities. The affect of consolidating and capping the fill on groundwater quality should be evaluated. Placement of an impermeable cap would obviate the need for groundwater collection and treatment. Capping the site would likely eliminate any groundwater mound under the waste mass.

7. The remedial objectives presented in Section 3.2 are based upon risk reduction levels which assume future site use as residential. Obviously the site will never be used for such purposes and therefore the alternatives developed far exceed what is

necessary or appropriate. Institutional controls can be used to further restrict future land use at the site.

Risk reduction levels and remedial objectives should be based upon the true environmental and public health objectives. As such, institutional controls in conjunction with containment will result in acceptable reduction of risk and avoid the numerous risks and general nuisance conditions posed by excavation and incineration.

8. Section 3.2 identifies the remedial objectives for each environmental media. The stated objectives for groundwater, surface water and surface water sediments can all be attained by containment alternatives. The stated objectives for soil reference the USEPA guidance document "Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites" (USEPA February 1991) and the preference for developing remedies which permanently and significantly reduce the volume, toxicity, or mobility of hazardous substances of wastes, and concludes that incineration is appropriate. However, the guidance document acknowledges, where wastes are not readily accessible or where excavation would be difficult or risky, that engineering controls and containment alternatives which provide acceptable reduction of health and environmental risks are acceptable.

9. Five alternatives were evaluated under the FS, four action alternatives and one no action alternative. According to USEPA's own evaluation, each of the four action alternatives will achieve the stated remedial objectives and provide an adequate reduction of the existing risk presented by the site (see Section 4.1).

   According to the Feasibility Study, Alternative 2 (incineration) and Alternative 5 (incineration plus vapor extraction) cost $28,700,000 and $29,000,000 respectively. Similarly, Alternatives 3 and 4, both of which recommended encapsulation, cost $15,500,000 and $14,800,000 respectively. As such the selected remedy (Alternative 5) is twice as expensive (using USEPA's calculations) as the encapsulation alternatives (Alternatives 3 and 4) with no commensurate reduction of risk or protection to the environment. USEPA has not demonstrated that the incremental cost of the selected remedy over the encapsulation alternatives is justifiable. Additionally, USEPA has failed to adequately address the risks associated with excavation of the wastes.

10. Except for the use of soil vapor extraction, Alternatives 2 and 5 are identical. Except for very minor differences in the cover system design, Alternatives 3 and 4 are identical. The Feasibility Study did not follow applicable guidance because it developed what amount to only two alternatives instead of a wide array of potential alternatives.

    As FS evaluation should consider a range of different alternatives to provide a range of environmental benefit, costs, implementability and effectiveness. This FS fails to provide a range, and the selection process defaults to the most costly option even though alternatives meeting the remedial objectives with fewer risks posed during construction, costing half as much, that could be implemented significantly faster, with a greater ease of implementation are passed over.

11. The field investigations to date lack much of the detail required to properly assess and evaluate the applicability of incineration technologies and to adequately evaluate construction and operating costs.

12. Alternative 2 and 5 include the excavation and handling of currently buried waste, including an unknown quantity of explosive wastes. The potential risks to workers, public health and the environment have not been evaluated. The presence of any explosive wastes will strongly support in-place containment as the preferred option.

13. Alternative 2 and 5 involve incineration which will require on-site test burns and the application for an air emissions control devise permit. As such the implementation of Alternative 2 or 5 will be significantly more difficult and time consuming than implementation of Alternative 3 or 4. Alternatives 2 and 5 may realistically take 5 years or longer to implement than Alternatives 3 and 4.

14. Under Alternative 2 and 5, the volume of soil requiring excavation and incineration has been estimated based upon minimal data. The actual quantity requiring incineration under these alternatives could be significantly greater.

15. Under Alternative 2 and 5 a significant quantity of demolition debris presently overlying buried waste layer will need to be removed and managed. It would be more appropriate and cost-effective to cap the material in place.

16. Alternatives 3 and 4 involve in-place containment through the installation of a multi-layered final cover system. Due to existing site topography a concrete retaining wall is proposed for a portion of the cover. A significant quantity of fill will also need to be imported to the site to prepare the landfill for placement of the final cover. The cost estimates for Alternative 3 and 4 do not fully address these issues.

17. The details provided regarding each of the alternatives, including limits of the cover system, specifics of the groundwater collection and treatment system, depth of excavation, extent of the concrete retaining wall, etc. are not sufficient for determining constructability nor for evaluating costs. The encapsulation cell design should be presented by several cross sectional views to determine fill and grading requirements.

18. Detailed cost estimates presented in Appendix IX raise additional questions.

    18.1 Slurry wall costs for northern and southern walls are based on assumed depths of 15 feet and 10 feet respectively. Additional borings are needed during the design phase to confirm the depth and proposed routes, and cost estimates revised accordingly.

    18.2 Similarly, the proposed interceptor trench is assumed to be 17 feet deep. Depth and location need to be confirmed during design phase. The cost of supplemental investigations should be included.

    18.3 Equipment proposed for the groundwater treatment system are excessive - (i.e. why glass lined storage tanks?). Additionally the costs for performing a treatability study should be included.

    18.4 Treatment building costs approximate $60/sf which are well in excess of the costs typical of a warehouse building.

18.5 Buried lagoon excavation costs do not include the off site management and disposal of soils which can not be incinerated.

18.6 Buried lagoon excavation costs present a construction dewatering system, however, the costs do not appear to address the cost for treating the collected water.

18.7 Installation of the slurry wall, interceptor trench and excavation of the buried lagoon require level B health and safety protection for certain phases of the work. Providing this level of protection is costly and can be avoided if the containment option is pursued.

18.8 The concrete retaining wall cost of $946,800 included in the multi media cap estimate may be underestimated. This wall will need to be designed with appropriate anchors and foundation to support the waste fill loads behind the wall. The wall may also require an impervious liner. These costs can be avoided by simply regrading the site and capping.

18.9 Incineration costs do not appear to include the cost of permitting.

19. Appendix II provides soil remedial action levels based on criteria generated to protect groundwater quality. These calculations did not consider any attenuation or dilution factor(s) of groundwater. Therefore, these criteria may be orders of magnitude too restrictive.

20. Since institutional controls and State law will preclude residential uses of the site, it may be more appropriate to establish soil remediation action levels which are protective of human health based on ingestion and direct contact of soil via occupational or recreational scenarios.

21. Appendix VII ignores potential health risks during excavation of soils, due to the presence of explosives on the site. It is arbitrary and capricious and inconsistent with the NCP and USEPA's guidance documents to recommend excavation when all risks associated with excavation were not evaluated as required. The USEPA must leave the soils in place or it unnecessarily completes an exposure pathway and <u>increases</u> the risks to the community and site workers by excavation.

Appendix B

Revised Cost Estimate

APPENDIX B
REVISED COST ESTIMATE
USEPA'S PREFERRED ALTERNATIVE

Remedial Element	Cost
Alternate Water Supply	$89,900
Institutional Action/Site Work	$260,800
Northern Slurry Wall and Groundwater Diversion	$593,500
Southern Slurry Wall	$385,000
Interceptor Trench	$987,100
Groundwater Treatment System	$282,200
Vacuum Extraction System	$455,800
Incineration	$16,661,200
Multi-Media (Subtitle C) Cap	$11,903,700
Waste Lagoon Excavation	$8,984,500
Construction Subtotal	**$40,603,700**
Engineering (7%)	2,842,300
Construction Management (10%)	4,060,400
Contingencies (20%)	$8,120,700
Construction Total	**$55,627,100**
General Operation & Maintenance (Present Worth) (Interceptor Trench, Groundwater Treatment, and Cap Maintenance; GW/SW Monitoring)	8,597,700
Incinerator Operation	24,144,400
Vapor Extraction Operation	$131,800
Operation & Maintenance Total	**$32,873,900**
TOTAL COST OF REMEDIAL ALTERNATIVE	**$88,501,000**

B

TECHNICAL REVIEW COMMENTS ON THE USEPA FACT SHEET FOR THE SKINNER LANDFILL DECEMBER, 1992

Prepared for:
The Skinner Landfill PRP Group

February 8, 1993

DUNN

1.0 INTRODUCTION

This report represents the results of a technical evaluation of the USEPA Fact Sheet for the Skinner Landfill Site issued December, 1992 prepared by Dunn Corporation (DUNN) on behalf of the Skinner Landfill PRP Group. It should be noted that the Skinner Landfill PRP Group previously submitted technical comments in a DUNN report entitled, "Technical Comments on the Proposed Plan for Skinner Landfill", dated September 21, 1992. The previous comments were prepared regarding the USEPA's Phase I remedial investigation, Phase II remedial investigation, baseline risk assessment, feasibility study, and proposed plan for the Skinner Landfill Superfund Site.

2.0 OVERVIEW OF TECHNICAL FINDINGS

The review of the Fact Sheet which outlines USEPA's current approach to the Skinner Landfill Superfund Site raises three areas of interest that warrant comment. These areas include:

- Extent of contaminant migration;
- Containment remedy using a performance standard - implementation and components of the preferred remedy; and,
- Soil vapor extraction (SVE).

The extent of contaminant migration is a subject that was central to our previous comments made to USEPA. Those comments are expanded and additional details and information is provided. A thorough understanding of the limited nature of contamination migration is central to the subsequent comments.

2.1 Extent of Contaminant Migration

The Fact Sheet states that:

> *"However, large-scale migration of these contaminants into the groundwater has not yet occurred"(page 5)*

This statement is correct but really understates the current situation. The groundwater data for the studies to date, which involve the collection of over 100 groundwater samples on the site over a four (4) year period indicate that the extent of potential groundwater contamination from the buried waste lagoon and the landfill areas is limited to the immediate vicinity of the lagoon, even after more then fifteen years of uncontrolled infiltration of precipitation through these materials without any engineering controls to limit potential migration.

The groundwater data for the site simply do not show the presence of contamination attributable to the buried lagoon materials or the landfill area. If the buried lagoon materials in the landfill area were sources of contaminants for groundwater, a plume -- a coherent consistent pattern of contamination – would be present. The absence of an identifiable groundwater plume is a strong indication that the buried lagoon materials have very little current or future environmental mobility, and that the landfill area is not a significant source of releases to the environment. The setting of the buried lagoon materials at the site (above the water table and below 20 feet of demolition debris) indicate that these materials are quite effectively isolated.

The compounds that have been detected in the buried lagoon include volatile organics, pesticides and polynuclear aromatics. Of these classes of compounds, only the volatile organics are environmentally mobile. The others have a much greater affinity for being absorbed into the soil rather then being dissolved in the water. The data clearly support this fact, as not one pesticide or polynuclear aeromatic compound was reliably found in groundwater. The USEPA's proposed plan issued April, 1992, supports this conclusion stating:

> *"The majority of the compounds in the waste lagoon are largely immobile because they bind tightly to the clay soils below the waste lagoon and are not dissolved by water" (page 5).*

If the buried waste lagoon is a source, then the contaminants that are found in the buried waste lagoon, should be found in the groundwater. Table 1 shows a summary of the maximum concentration of contaminants found in each of the borings drilled into the buried waste lagoon. Table 2 shows a summary of the constituents that were reliably detected in groundwater. Although the highly mobile toluene is found most frequently and in the greatest concentration in the source area, it has not been reliably found in any well on site. Only five wells have detected volatile organics on a reliable basis and the constituents found in these wells, are not consistent and do not reflect the chemical characteristics of the buried waste lagoon source area. The volatiles that have been reliably detected in groundwater are shown on Table 2. It should be noted that well GW-22 is located in the active landfill and that wells GW-20, GW-21 and B5 are located very close to the buried waste lagoon. GW-07 seems to indicate a situation local to the immediate area of the well and does not appear to relate to the buried waste lagoon. A summary of the volatile organic results detected in groundwater on a per-well basis is included in the Appendix.

These results really are very significant as they indicate that the contaminants are not migrating. The fact that the contaminants are isolated, not migrating even after having the opportunity to do so over fifteen years of uncontrolled infiltration to the site, is central to our subsequent comments.

2.2 Containment Remedy Using a Performance Standard - Implementation and Components of the Preferred Remedy

As stated in the previous section, the contaminants on the site in the primary source area, the buried waste lagoon, have not migrated to any significant extent. The USEPA, through the December, 1992 Fact Sheet, has indicated a preference for a containment alternative. The PRP Group agrees that the containment alternative is the preferred remedy for the site, and that the components of the containment remedy should be those that are necessary to contain the contaminants on site and prevent their migration off site.

The containment remedy and the site conditions are well suited to the use of a performance standard. In using this approach, the selection of the remedy components are based on engineering evaluation to determine what is needed to meet the performance standard. This approach also seems to have good community acceptance based on comments following the presentation that was made by the PRP Group and Dunn Corporation to the Coalition of interested citizens. At this site, the performance standard to be met is containing the waste material and preventing the off-site release of contaminants.

It is important to note that the remedy will be supported by continued monitoring over a 30-year period. Additionally, the effectiveness of the remedy will be subject to a periodic (at least every five years) re-evaluation to ensure that the remedy is protective of human health and the environment. This is an important concept because it illustrates that the remedy is not necessarily a one-time event but rather there is ample opportunity for correcting any deficiencies.

Alternative 3, as presently structured, includes a series of remedial components including a multi-layer cap, groundwater monitoring, upgradient and downgradient slurry walls, and groundwater collection and treatment. A detailed engineering evaluation should be performed to determine which of these components are necessary to optimize the design. The engineering evaluation should be performed during the remedial design phase of the project.

The performance-based approach to the selection of the remedy components is straightforward. Those components that are needed to ensure that the remedy meets the performance criteria are implemented. In the event that components may be required in the future if certain other events occurs, then those components are staged and not implemented unless and until they are needed. This strategy is used unless it is demonstrated that the events that may occur could change things so dramatically and in such a short period of time that the additional components could not be implemented in a timeframe in which they could be effective. Specifically for the Skinner Landfill Site to meet the performance criteria of containing contamination and preventing its release off site, the following components would be most effective:

<u>Cap Installation</u> - The proper cap which will essentially eliminate infiltration and stop migration of contaminants to the groundwater is the essential component of this remedy. In addition to essentially eliminating infiltration and migration of contaminants from the source area, the cap will also lower the groundwater table and further increase the separation of the waste from the groundwater. Lowering of the water table will reduce gradients and lessen the rate of groundwater movement from the site.

<u>Groundwater Monitoring</u> - A good groundwater monitoring system is also essential in this performance based approach as it is the measuring stick for your performance criteria. This system should be designed to provide the information needed to determine whether additional components (groundwater collection and treatment) are needed. The monitoring

system should also be designed to provide the time needed to implement groundwater collection and treatment if it is necessary.

Soil Vapor Extraction (SVE) - The PRP Group, in the technical comments dated September 21, 1992, proposed the consideration of SVE. This remedy component does offer the potential to collect and treat soil vapors from the natural soils underlying the buried waste lagoon. Since the volatiles which would be collected by this system are the only constituents which are mobile in the environment, their removal will prevent future contamination of groundwater. This is superior to allowing migration and then collecting and treating the contaminated water. We continue to support this component rather then groundwater control, if the results of a field scale pilot test indicate that it is feasible and effective given the limitations of this site.

The implementation of this component clearly supports the performance objective approach of preventing the release of contaminants from the site and further reduces the likelihood of contaminant migration to groundwater. Selection of soil vapor extraction also more clearly satisfies Superfund's preference for treatment and permanence.

2.3 Groundwater Interception

At this site, groundwater movement is slow and will be slower after the installation of the cap, providing the time to implement groundwater collection and treatment if it is necessary. There does not seem to be any reason to implement multiple remedial components that are redundant. If groundwater collection and treatment were installed at the present time, we would be collecting and treating groundwater that is essentially clean. Again, if monitoring indicates that groundwater collection and treatment is needed to meet the performance objectives of containing contaminants and preventing their release from the site, then groundwater collection and treatment should be installed.

A similar comment applies to the installation of slurry walls. They should be installed if they are needed to meet the performance objectives at the site. This should be an engineering design decision. The need for an upgradient slurry wall seems the least appropriate of all the options proposed. Its apparent purpose is to reduce the groundwater flowing underneath the buried waste lagoon. If contaminants are located in the groundwater, or migrating to groundwater, then this would tend to reduce the amount of groundwater flowing through the contaminated area and reduce, to some extent, the volume of contaminated groundwater. However, the effectiveness of this, again, needs to be based on engineering evaluation. Further, if groundwater collection and treatment are subsequently shown to be necessary, there may be a more appropriate design than the groundwater interception/downgradient slurry wall combination presented in the Fact Sheet.

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February 8, 1993

	WASTE BORINGS: MAXIMUM CONC. MG/KG (PPM) IN ANY SAMPLE															
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
	N=3	N=2	N=5	N=3	N=3	N=3	N=5	N=2	N=2	N=2	N=3	N=3	N=2	N=2	N=2	N=2
TOLUENE	0.14	0.10	2	0.23	300	470	31K	0.28	290	6300	5.6	0.17	0.98	1500	35	0.16
ETHYLBENEZENE		0.01	3.5		31		36		5.5	35	1.7			98	3.3	
XYLENE		0.05	4		93	2.5	51		22	89	1.9			200	4.9	
BENZENE			7		8.5		10		6.3					60		
1,2-DCA			13		6.7				22	0.66	0.24			210	0.53	
1,1,1-TCA					14									63		
1,1,2-TCA					16				61	2	0.07			370	2.3	
TCE					34				10					140		
PCE					14				9.9					44	0.86	
CHLOROFORM					3.9				0.22					33		
CARBON TET					37									160		
1,2-DCPROP					30				130	0.99	0.14			340	3.2	
1,1,2,2-TETR CA					11				32					130		
CHLOROBENZENE							5							15		
STYRENE							3.6			25	0.41					
TOTAL VOC'S	0.14	0.16	29.5	0.23	599.1	472.5	31.1K	0.28	588.9	6453	10.06	0.17	0.98	3363	50.09	0.16
TOTAL BNA'S	0.09	0	16	6.4	2937	63.3	307	0	580.2	798.7	704	0.89	0	3926	112	3.3
TOTAL PESTICIDES	0.008	0	0.016	0.008	191	0	0	0	6.64	6.6	0	0.1	0	0	30.3	0

Table 1

Volatile Organics Found in Soil Borings in the Buried Waste Lagoon Area

TABLE 2

SUMMARY OF VOCs DETECTED IN GROUNDWATER

Well	Constituent	Concentration (ppb)
GW07	1,2-DCE	5 - 27
GW20	Benzene	280 - 1K
GW21	Chlorobenzene	8
GW22	Benzene	120 - 20K
B5	11 VOCs	17 - 370

APPENDIX

WWES Sample Id:												ROCK
Sample Date:	GW 06				GW 07				GW 38			INSTL
Compound Name	R1	R2	R3	P2	R1	R2	R3	P2				P2
Chloromethane			10 J				10 J					
Bromomethane												
Vinyl Chloride					4 J							
Chloroethane												
Methylene Chloride	15 JB				6 B		10 J					
Acetone	500 B	15	10 J	19	12 B							
Carbon Disulfide												
1,1-Dichloroethene												
1,1-Dichloroethane					1 J							
1,2-Dichloroethene					27	11	10	5				
Chloroform												
1,2-Dichloroethane												
2-Butanone	40 JB		10 JR		4 JB		10 JR					
1,1,1-Trichloroethane												
Carbon Tetrachloride												
Vinyl Actetate												
Bromodichloromethane												
1,2-Dichloropropane												
cis-1,3-Dichloropropene												
Trichloroethene												
Dibromochloromethane												
1,1,2-Trichloroethane												
Benzene		1.6 J										
trans-1,3-Dicloropropene												
Bromoform			5 J				5 J					
4-Methyl-2-Pentanone												
2-Hexanone												
Tetrachloroethene												
1,1,2,2-Tetrachloroethane												
Toluene		1.3 J		5 B				3 J				3 J
Chlorobenzene												
Ethylbenzene												
Styrene												
Xylene (total)												

Note: Shaded areas indicate this well was not sampled during this event.

SHEET2.XLS

WWES Sample Id:								ROCK
Sample Date:	GW 08	DRY	DRY	ABAND	GW 28			INSTL
Compound Name	R1							P2
Chloromethane								
Bromomethane								
Vinyl Chloride								
Chloroethane								
Methylene Chloride	4 J							
Acetone	5 J							
Carbon Disulfide								
1,1-Dichloroethene								
1,1-Dichloroethane								
1,2-Dichloroethene								
Chloroform								
1,2-Dichloroethane								
2-Butanone								
1,1,1-Trichloroethane								
Carbon Tetrachloride								
Vinyl Actetate								
Bromodichloromethane								
1,2-Dichloropropane								
cis-1,3-Dichloropropene								
Trichloroethene								
Dibromochloromethane								
1,1,2-Trichloroethane								
Benzene								
trans-1,3-Dicloropropene								
Bromoform								
4-Methyl-2-Pentanone								
2-Hexanone								
Tetrachloroethene								
1,1,2,2-Tetrachloroethane								
Toluene								
Chlorobenzene								
Ethylbenzene								
Styrene								
Xylene (total)								

Note: Shaded areas indicate this well was not sampled during this event.

SHEET3.XLS

WWES Sample Id:								
Sample Date:	GW 09				GW 10			
Compound Name	R1	R2	R3	P2	R1	R2	R3	P2
Chloromethane			10 J				10 J	
Bromomethane								
Vinyl Chloride								
Chloroethane					17	19		
Methylene Chloride		3.3 J		6				6
Acetone		9.5 J	10 J				2 J	23
Carbon Disulfide								
1,1-Dichloroethene								
1,1-Dichloroethane								
1,2-Dichloroethene								
Chloroform								
1,2-Dichloroethane								
2-Butanone			10 JR				10 JR	
1,1,1-Trichloroethane								
Carbon Tetrachloride								
Vinyl Actetate								
Bromodichloromethane								
1,2-Dichloropropane								
cis-1,3-Dichloropropene								
Trichloroethene								
Dibromochloromethane								
1,1,2-Trichloroethane								
Benzene								
trans-1,3-Dicloropropene								
Bromoform			5 J				5 J	
4-Methyl-2-Pentanone								
2-Hexanone								
Tetrachloroethene	4 J							
1,1,2,2-Tetrachloroethane								
Toluene	3 JB	1.3 J			1 JB	1.3 J	1 J	
Chlorobenzene								
Ethylbenzene								
Styrene								
Xylene (total)								

WWES Sample Id:								
Sample Date:	GW 11				GW 12			
Compound Name	R1	R2	R3	P2	R1	R2	R3	P2
Chloromethane			10 J				10 J	
Bromomethane								
Vinyl Chloride								
Chloroethane								
Methylene Chloride	5				2 JB			
Acetone	14		10 J		5 JB		10 J	
Carbon Disulfide								
1,1-Dichloroethene								
1,1-Dichloroethane								
1,2-Dichloroethene								
Chloroform								
1,2-Dichloroethane				5				
2-Butanone			10 JR				10 JR	
1,1,1-Trichloroethane								
Carbon Tetrachloride								
Vinyl Actetate								
Bromodichloromethane								
1,2-Dichloropropane								
cis-1,3-Dichloropropene								
Trichloroethene								
Dibromochloromethane								
1,1,2-Trichloroethane								
Benzene								
trans-1,3-Dicloropropene								
Bromoform			5 J				5 J	
4-Methyl-2-Pentanone								
2-Hexanone								
Tetrachloroethene								
1,1,2,2-Tetrachloroethane								
Toluene		1.4 J	2 J				1 J	4 J
Chlorobenzene			2 J				2 J	
Ethylbenzene								
Styrene								
Xylene (total)								

SHEET5.XLS

WWES Sample Id:								
Sample Date:	GW 21	INACCS		ABAND	GW 22			ABAND
Compound Name	R1	R2	R3		R1	R2	R3	
Chloromethane			10 J					
Bromomethane								
Vinyl Chloride								
Chloroethane								
Methylene Chloride	3 J		3 J			810 B	2.2K J	
Acetone	25		10 J		79		4.8K	
Carbon Disulfide								
1,1-Dichloroethene								
1,1-Dichloroethane								
1,2-Dichloroethene								
Chloroform								
1,2-Dichloroethane							4.5K	
2-Butanone	65		10 JR				1K JR	
1,1,1-Trichloroethane								
Carbon Tetrachloride								
Vinyl Actetate								
Bromodichloromethane								
1,2-Dichloropropane								
cis-1,3-Dichloropropene								
Trichloroethene								
Dibromochloromethane								
1,1,2-Trichloroethane								
Benzene	14		4 J		120	2K	20K	
trans-1,3-Dicloropropene								
Bromoform			5 J					
4-Methyl-2-Pentanone								
2-Hexanone							740 J	
Tetrachloroethene								
1,1,2,2-Tetrachloroethane								
Toluene			2 J		4 J	420 JB	530	
Chlorobenzene	8		8				140 J	
Ethylbenzene					80		100 J	
Styrene								
Xylene (total)					180		300 J	

Note: Shaded areas indicate this well was not sampled during this event.

SHEET6.XLS

WWES Sample Id:								ROCK
Sample Date:	GW 20				GW 27			INSTL
Compound Name	R1	R2	R3	P2				P2
Chloromethane								
Bromomethane								
Vinyl Chloride				8 J				
Chloroethane	41 J			50				
Methylene Chloride	20 JB	4.1K B	170 J					
Acetone	760 B	5.9K	920					
Carbon Disulfide								
1,1-Dichloroethene								
1,1-Dichloroethane				73				
1,2-Dichloroethene	21 J		31 J	32				
Chloroform								
1,2-Dichloroethane				7				
2-Butanone	190 B		170 JB					
1,1,1-Trichloroethane								
Carbon Tetrachloride								
Vinyl Actetate								
Bromodichloromethane								
1,2-Dichloropropane				21				
cis-1,3-Dichloropropene								
Trichloroethene				2 J				
Dibromochloromethane								
1,1,2-Trichloroethane								
Benzene	280	1K	400	410 E				
trans-1,3-Dicloropropene								
Bromoform								
4-Methyl-2-Pentanone								
2-Hexanone								
Tetrachloroethene								
1,1,2,2-Tetrachloroethane								
Toluene	1.5K	11K B	3.1K	44				
Chlorobenzene			26 J	4 J				
Ethylbenzene	19 J		52 J	20				
Styrene								
Xylene (total)	34 J		100	14				

Note: Shaded areas indicate this well was not sampled during this event.

SHEET7.XLS

WWES Sample Id:								
Sample Date:	GW 17				GW 18			
Compound Name	R1	R2	R3	P2	R1	R2	R3	P2
Chloromethane								
Bromomethane								
Vinyl Chloride								
Chloroethane								
Methylene Chloride	14		15 J	85	20 JB		3 J	20 J
Acetone	14 J							
Carbon Disulfide				35				
1,1-Dichloroethene								
1,1-Dichloroethane								
1,2-Dichloroethene								
Chloroform								
1,2-Dichloroethane								
2-Butanone			10 JR		36 J		10 JR	
1,1,1-Trichloroethane								
Carbon Tetrachloride								
Vinyl Actetate								
Bromodichloromethane								
1,2-Dichloropropane								
cis-1,3-Dichloropropene								
Trichloroethene								
Dibromochloromethane								
1,1,2-Trichloroethane								
Benzene	340			690	950			890
trans-1,3-Dicloropropene								
Bromoform								
4-Methyl-2-Pentanone								
2-Hexanone								
Tetrachloroethene	20 J							
1,1,2,2-Tetrachloroethane								
Toluene	4 JB	3.6 JB				3.3 J		
Chlorobenzene				24 J				27
Ethylbenzene								
Styrene								
Xylene (total)								

SHEET8.XLS

WWES Sample Id:												
Sample Date:	B8				GW 19				B5			
Compound Name				P2	R1	R2	R3	P2				P2
Chloromethane												
Bromomethane												
Vinyl Chloride												48
Chloroethane												
Methylene Chloride				3 J		6.7 B	3 J					
Acetone												
Carbon Disulfide												
1,1-Dichloroethene												
1,1-Dichloroethane												52
1,2-Dichloroethene												35
Chloroform												
1,2-Dichloroethane												180
2-Butanone							10 JR	12				
1,1,1-Trichloroethane												16
Carbon Tetrachloride												85
Vinyl Actetate												
Bromodichloromethane												
1,2-Dichloropropane												370
cis-1,3-Dichloropropene												
Trichloroethene												71
Dibromochloromethane												
1,1,2-Trichloroethane												55
Benzene												21
trans-1,3-Dicloropropene												
Bromoform												
4-Methyl-2-Pentanone												
2-Hexanone												
Tetrachloroethene												3 J
1,1,2,2-Tetrachloroethane												
Toluene						4.1 JB		0.7 J				24 B
Chlorobenzene												
Ethylbenzene												7 J
Styrene												
Xylene (total)												17

Note: Shaded areas indicate this well was not sampled during this event.

WWES Sample Id:								ROCK
Sample Date:	GW 16			ABAND	GW 26			INSTL
Compound Name	R1	R2	R3					P2
Chloromethane								
Bromomethane								
Vinyl Chloride								
Chloroethane								
Methylene Chloride	7		4 J					
Acetone	2 J		2 J					10
Carbon Disulfide								
1,1-Dichloroethene								
1,1-Dichloroethane								
1,2-Dichloroethene								
Chloroform								
1,2-Dichloroethane								
2-Butanone			10 JR					
1,1,1-Trichloroethane	12		1 J					
Carbon Tetrachloride								
Vinyl Actetate								
Bromodichloromethane								
1,2-Dichloropropane								
cis-1,3-Dichloropropene								
Trichloroethene								
Dibromochloromethane								
1,1,2-Trichloroethane								
Benzene								
trans-1,3-Dicloropropene								
Bromoform								
4-Methyl-2-Pentanone								
2-Hexanone								
Tetrachloroethene			5 J					
1,1,2,2-Tetrachloroethane								
Toluene		3.8 JB						2 J
Chlorobenzene			3 J					
Ethylbenzene								
Styrene								
Xylene (total)								

Note: Shaded areas indicate this well was not sampled during this event.

Declaration for the Record of Decision

Site Name and Location

Buckeye Reclamation Landfill Site, Belmont County, Ohio

Statement of Basis and Purpose

This decision document presents the selected remedial action for the Buckeye Reclamation Landfill site, in Belmont County, Ohio, which was chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision document explains the factual and legal basis for selecting the remedy for this site.

The Ohio Environmental Protection Agency concurs with the selected remedy. The information supporting this remedial action decision is contained in the administrative record for this site.

Assessment of the Site

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial threat to public health, welfare, or the environment.

Description of the Selected Remedy

This is the first and only operable unit for the site. The remedy selected in this Record of Decision will address principal threats posed by the site by treating contaminated surface and ground waters and eliminating exposure to contaminated surface soils. Because the selected remedy involves long-term treatment of collected surface leachate and ground water, operation and maintenance of the treatment system will be required.

Major components of the selected remedy include the following:

* Solid Waste Landfill Cap
* Institutional Controls
* Fencing
* Ground water collection
* Surface leachate seep collection
* Ground water monitoring
* Surface leachate seep monitoring
* Monitoring of Kings Run

* Leachate/ground water treatment by constructed wetlands

A solid waste landfill cap will be constructed over all areas where landfilling activities occurred and areas which would allow water infiltration into and under the landfill. The ground water and surface leachate collection system will eliminate contaminated water discharges into surface waters and channel the collected waters to a constructed wetlands. Wetlands treatment of the landfill leachate and ground water is an innovative technology which has proven effective in removing contaminants of concern during preliminary treatability studies. Periodic sampling of water media at the site will monitor any contaminant migration. Installing a fence around the site will discourage trespassing and institutional controls will be sought to specify that the constructed remedy is not tampered with in the future.

Declaration of Statutory Determinations

The selected remedy is protective of human health and the environment, is cost-effective and complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action. A waiver can be justified for any federal and state applicable or relevant and appropriate requirements that will not be met. This remedy utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable, and it satisfies the statutory preference for remedies that employ treatment that reduce toxicity, mobility, or volume as their principal element.

Because this remedy will result in hazardous substances remaining on site above health-based levels, a review will be conducted every five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

U.S. EPA Regional Administrator
Region V

Date

Decision Summary for the Record of Decision

I. Site Name, Location, and Description

The Buckeye Reclamation Landfill (BRL) is located off of State Route 214, approximately 4 miles southeast of St. Clairsville and 1.2 miles south of Interstate 70 in Sections 20 and 21 (Township 6 North, Range 3 West), Richland Township, Belmont County Ohio (Figure 1). Interstate 470 is located just south of the landfill entrance and approximately 3,000 feet north of the landfill area.

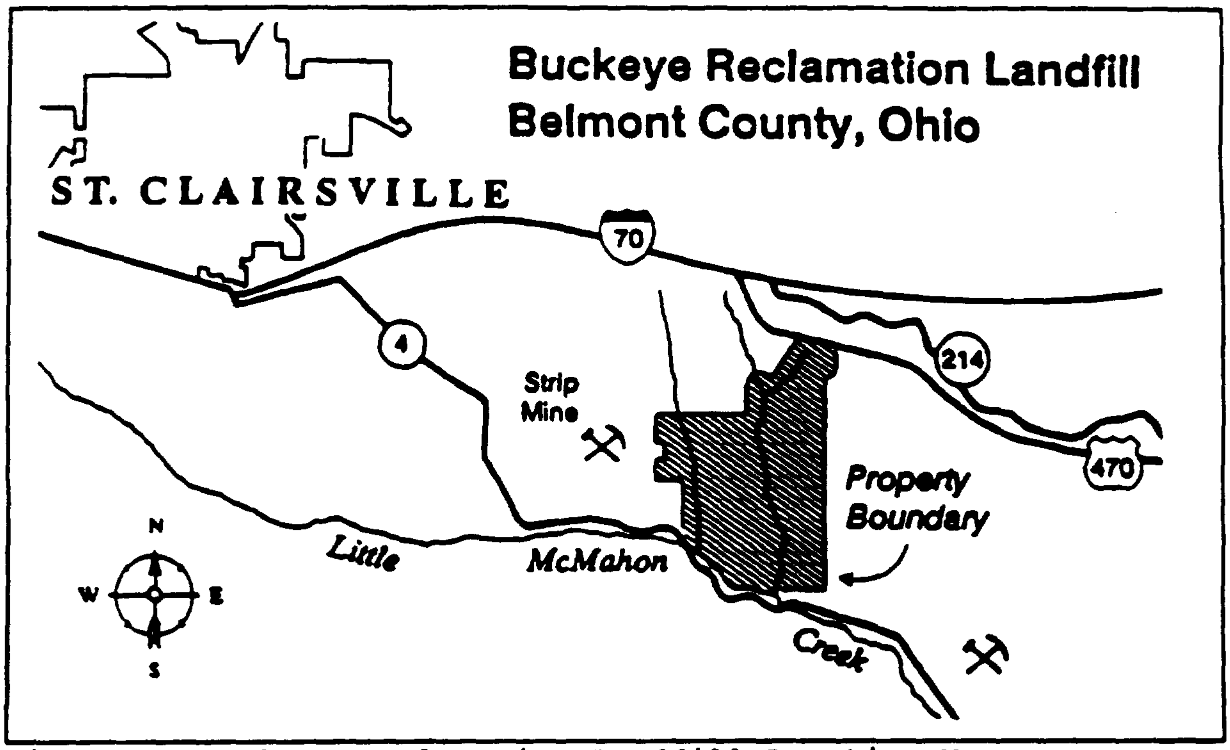

Figure 1. Buckeye Reclamation Landfill Location Map

The BRL site is situated in the Kings Run drainage ravine; it is bordered by King's Run to the east and Unnamed Run to the west. King's Run flows to the south and empties into Little McMahon Creek. The landfill extends approximately 3,700 feet north to south and is approximately 500 to 1,000 feet wide. The site on which the landfill is located occupies 658 acres. The landfill occupies approximately 50 acres of this area.

The original topography of the valley of King's Run and the ridge to the west has been altered by coal mine refuse disposal and landfill operations (Figure 2). Prior to 1950, coal mine refuse was removed from deep coal mines and deposited in the valley. Refuse placement dammed Kings Run, creating northern, middle, and southern impoundments. Subsequent landfilling operations resulted in the draining and filling of the middle and southern impoundments by 1972 and 1976, respectively. A fourth impoundment, referred to as the Waste Pit, was created by the damming of a western tributary of King's Run by mine refuse.

Property surrounding the site to the east and west is hilly and mostly forested. West of the site is Ebbert Road. Along this road are farms and further to west, a strip mine. To the south, the land is forested along the steeper slopes, and cleared for residential use along the stream valleys and roadways. There is more farmland to the north and northeast.

Within the vicinity of the site, the most complete accounting of the number of households was performed during the domestic well survey. Approximately 200 homes were surveyed within a two-mile radius of the site, downstream of the site boundaries. Approximately 40 households are located within a 1-mile radius of the Waste Pit. Assuming equivalence with the statistics for the remainder of Richland Township, this equates with a population of 2.77 persons per household, or 110.8 people. This is also approximately equivalent to 7 persons of under 5 years old, 18 from ages 5-14, 36 from ages 15-34, 38 from ages 55-64, and 13 from ages 65 and over. Natural resources in Belmont County, Ohio include large areas of predominantly deciduous forest land (42 percent), agricultural lands (35 percent), and lands used for coal mining (both underground and strip mines). There are also four active limestone quarries in the county. Aquatic biota are considered to receive the greatest impact from the site via site runoff and acid mine drainage (AMD) contributions to local streams.

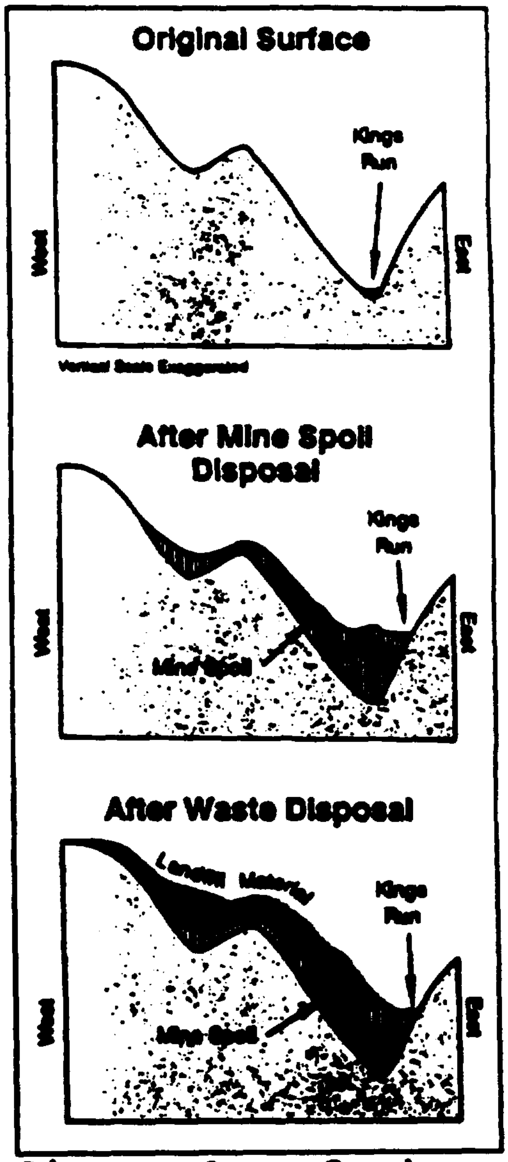

Figure 2. Buckeye Reclamation Landfill Disposal History

Surface water use in the area includes the following upstream discharge points for treated wastewater to Little McMahon Creek; 1) City of St. Clairsville public water supply, 2) City of St. Clairsville west sewage

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3,300 tons of industrial solid wastes. Transporter records show that the majority of the liquids were oil/solvent/water mixtures. Maleic anhydride wash water sludge, neutralized pickle liquor sludge, sodium sulfide, desulfurization plant sludge, maleic acid-fumaric acid wastes and special pumpings from maleic or fumaric acid spills were also known to have been deposited in the general area of the Waste Pit.

In 1980, the waste pit was filled by pushing some of the sludge, mine spoil and overburden soil into the impoundment. Photographic evidence exists that some of the sludge was buried in place on the slope of the waste pit. The waste pit area was then covered with soil and garbage and seeded to grasses. A low soil berm was graded in place upgradient of the Waste Pit to route surface flow around the area and prevent erosion.

Solid industrial wastes (i.e. asbestos, carbon black, fly ash, etc.) were disposed of with municipal wastes elsewhere in the landfill. Ohio Environmental Protection Agency (OEPA) landfill inspection reports also speak of unspecified industrial waste being disposed of in the southeastern portion of the landfill.

The Buckeye Reclamation Landfill site was listed on the National Priorities List by publication in the Federal Register on September 8, 1983. A Potentially Responsible Party (PRP) search identified a number of parties, including the landfill operator and several generators. Negotiations with PRPs for conducting the RI/FS were successfully concluded on September 19,1985. An Administrative Order by Consent (AOC) for this site was signed October 31, 1985. Signatory to the AOC are Cravat Coal Company, the landfill operator, and Ashland Chemical Company, Aristech Chemical Company (formerly U.S. Steel Corporation), Beazer East,Inc. (formerly Koppers Company, Inc.), Triangle PWC and SKF Industries, as waste generators. On June 26, 1986 the Consent Order was modified to include Kittle Hauling, a transporter, as a Respondent to the AOC.

III. Highlights of Community Participation

The Feasibility Study and the Proposed Plan for the Buckeye Reclamation Landfill site were released to the public for comment on May 15, 1991. These two documents were made available to the public in the administrative record and information repositories maintained at the EPA Docket Room in Region Five, at the St. Clairsville Public Library, St. Clairsville, Ohio, and the Neffs Branch of the Martins Ferry Public Library, Neffs, Ohio. The notice of availability for the documents was published in The Times Leader, Martins Ferry, Ohio and The Intelligencer, Wheeling, West Virginia on Monday, May 13, 1991. As required by CERCLA Sections 113 and 117, a public comment period on the documents was held from May 15, 1991 to June 24, 1991. In addition, a public meeting was held on May 30, 1991. At this treatment plant, and 3) treated wastewater from the Saginaw Mining Co. - Saginaw Plant. Little McMahon Creek is also designated as a limited resource water (AMD-impacted) stream.

A total of 46 domestic wells and springs were identified and located in the area downgradient of and within one mile of the site, and downstream from the confluence of Little McMahon Creek and King's Run for at least two miles.

II. Site History and Enforcement Activities

Deep mining occurred beneath the 658-acre site until around 1940. During that time, the site was a disposal area for mine refuse. Mine refuse was removed from the mines and disposed of on the ridge west of King's Run (see Figure 2) and in the drainage ravine for King's Run. The area was licensed as a public solid waste landfill in 1971 by the Belmont County Health Department and has been operated by Ohio Resources Corporation, under the name of Buckeye Reclamation Company, since that time. As a public landfill approximately 50 acres in size, the facility accepted general trash, rubbish and nonhazardous waste from municipalities and villages in the county and local area.

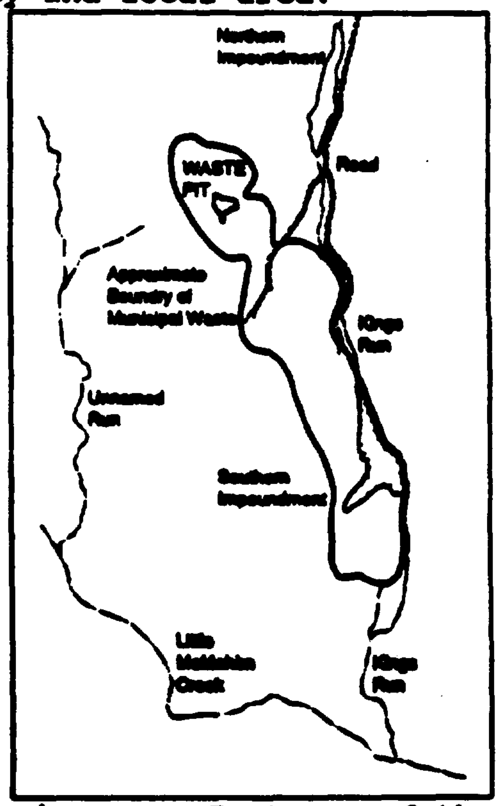

Figure 3. Features of the Buckeye Reclamation Landfill Site

Detailed records of the actual types and quantities of wastes and their on-site location are limited. A 1979 OEPA Solid Waste Disposal Questionnaire indicated the following distribution of materials received by the site.

- 55% household
- 20% industrial
- 10% commercial
- 5% agricultural
- 5% construction/demolition
- 2% incineration residue
- 1% dead animals

In addition, these records indicate a total volume of approximately 950 tons per week or 49,400 tons of solid waste per year were disposed at the site. The landfill also accepted industrial sludges and liquids. Most of these wastes were received between 1976 and 1979 and deposited in or near the Waste Pit. The Waste Pit was an impoundment located in the northern section of the landfill area (Figure 3). Estimated total volumes of industrial wastes received are 4.7 million gallons of liquid and

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meeting, representatives from U.S. EPA and Ohio EPA answered questions about problems at the site and the remedial alternatives under consideration. The proceedings were transcribed by a court reporter. A response to the comments received during this period is included in the Responsiveness Summary, which is part of this ROD.

IV. Scope and Role of Response Action Within Site Strategy

As with many Superfund sites, the problems at the Buckeye Reclamation Landfill site are complex. Adverse environmental impacts are derived from coal mine refuse present on the site (Acid Mine Drainage), hazardous waste disposal practices and solid waste disposal which have occurred at the site. As is discussed below, surface and subsurface soils and surface and ground water are contaminated to various degrees. Current and potential risks to human health and the environment are shown to be posed by this contamination. This ROD selects a remedial action for the site which addresses risks posed by all identified pathways.

V. Summary of Site Characteristics

The Buckeye Reclamation Landfill Remedial Investigation (RI) investigated the contaminant source area (landfill), soils, surface water and sediments, leachate, groundwater, and air. Numerous carcinogenic and noncarcinogenic contaminants were detected in most media sampled. Table 1 summarizes the average and maximum concentrations of all chemicals identified in media of concern at the site.

a. Source Area

An Electromagnetic (EM) Survey was first performed to ascertain the presence of buried drums or a distinguishable ground water plume of contamination. Findings of this survey did not reveal any buried drums and were unable to establish the presence of a contaminant plume.

Five locations within the Waste Pit were selected for soil borings to delineate contaminants present. Four of the borings were taken for chemical analyses and the fifth was collected for physical testing of the soil characteristics. The chemical analyses identified high levels of volatile organic compounds, semivolatile organic compounds and metals in the waste pit soils. Concentrations of the volatile and semivolatile contaminants peaked at two different depths in the Waste Pit and these peaks were associated with a brown, odorous oil visually identified in the borings. It is believed that this is the liquid originally present in the Waste Pit before it was filled.

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b. Soils

Twelve borings were performed throughout the site to collect landfill soils for chemical analysis. Numerous volatile organic compounds, semivolatile organic compounds and metals were detected throughout the borings. Low levels of asbestos and pesticides were also detected. In general, the concentrations of contaminants were lower than those of the Waste Pit.

c. Surface Water

Nine surface water stations were constructed to monitor surface water quality in King's Run, Unnamed Run and Little McMahon Creek. Two surface water runoff stations were also constructed to evaluate water running off of the surface of the Waste Pit and asbestos disposal area which is located in the southern portion of the landfill. Sample analyses determined that several semivolatile organic compounds and heavy metals were present in the surface waters (see Table 1, p. 43).

d. Sediments

Sediment samples were collected at eleven locations which included eight of the nine surface water stations, one in King's Run south of the asbestos disposal area and two in the former drainage ditch which runs on the west side of the active landfill. Several semivolatile organic compounds and a wide range of metals were detected (see Table 1, p. 43). Concentrations of the metals varied greatly. A trace of asbestos was detected in one sample.

e. Leachate

Six leachate samples were collected to provide additional information on the water-bearing formations in which on-site monitoring wells were installed. Three leachate seeps were sampled in the vicinity of the Waste Pit, one along Unnamed Run, one along King's Run and one at the southern toe of the landfill. Five of the six leachate seeps are affected to some degree by mine spoils and at least two of the leachate seeps are impacted by waste disposal practices. The sampling results showed high levels for metals including arsenic, cadmium and chromium (see Table 1, p. 42). Iron, manganese, and sulfate were also detected but are not of as much health concern. Comparison of the various sampling locations indicates that some of the inorganic contamination could be coming from the coal mine spoils located on-site. Three semivolatile organic compounds were detected in the leachate and low levels of volatile organic compounds were identified.

f. Air

The air investigation examined the potential for air releases from the Waste Pit and Asbestos Disposal Area. This investigation involved two studies: 1) a perimeter air survey to determine personal protection levels for on-site work, and 2) a quantitative air monitoring study to quantify on-site exposure. The perimeter air survey found no detectable asbestos or organic vapors, except methane, present anywhere on the site in the air.

g. Ground Water

A network of 25 monitoring wells was installed throughout the site. Water bearing units sampled include the unconsolidated material above the first confining layer (shallow upper zone or A-Zone), several bedrock aquifers including the Wegee limestone, Waynesburg coal, Uniontown sandstone, and Benwood limestone (deep upper zones or B-Zone), and an aquifer which underlies the entire site, the Redstone limestone (deep zone or C-Zone) (see Figure 4). The hydrogeology of the shallow upper zone appears to be controlled by the original topography and ground water generally flows north to south. Water enters the shallow upper zone through; 1) the northern impoundment, 2) King's Run, and 3) infiltration from the northwest. Ground water flow directions are to the north and southwest in the Wegee limestone and Waynesburg coal, respectively. Water levels in the Uniontown sandstone indicate flow from the east to the southwest, west, and northwest. Water enters the Benwood limestone chiefly in its outcrop area, much of it by percolation through the mine spoil, and moves generally southward in response to the regional gradient. The Redstone limestone only produced groundwater at two well locations. All bedrock formations show no indications of any substantial primary porosity or permeability. Ground water yields are the result of secondary porosity and permeability at joint faces, coal cleats, and along bedding planes. In, general, most ground water emanating from beneath the Buckeye Reclamation Landfill site is discharged laterally to surface water before leaving the site.

The overall ground water quality of the area reflects high levels of inorganic constituents (see Table 1, pages 38 - 42). Most of the monitoring wells on-site, including the background wells, exceed Secondary Maximum Contaminant Levels (SMCLs) for Total Dissolved Solids (TDS), iron, manganese, and sulfates. Maximum Contaminant Levels (MCLs) for a number of contaminants, including benzene, arsenic, chromium and lead, were exceeded in several water-bearing zones. Nineteen volatile organic compounds were detected in monitoring wells. Most were at low concentrations of less

Figure 4. Buckeye Reclamation Ground Water Monitoring Wells

than 10 ug/l. A-Zone wells contained the largest number of VOCs (11), B-Zone wells had fewer (6), and C-Zone wells the fewest (2). Semivolatile compounds detected in wells included naphthalene, 4-methyl phenol, and benzoic acid at low concentrations. A wide variety of types and concentrations of metals were detected in the monitoring wells. Metals found most commonly include aluminum, calcium, iron, magnesium, potassium, and sodium. Other metals found at lesser concentrations include barium, chromium, copper, nickel, zinc, arsenic, cadmium, lead or mercury.

Downgradient residential wells were also tested to determine if the site was impacting drinking water supplies. Metals were primarily detected in the wells. In addition, two organics, toluene and trichlorofluoromethane, were identified. Trichlorofluoromethane was not detected on the Buckeye Reclamation site. However, toluene was found in many samples on the site. The occurrence of toluene may indicate that contamination is migrating from the site.

h. Summary

The primary objective of the RI was to define the nature and extent of contamination at the Buckeye Reclamation Landfill site. Sampling results identified various levels of contamination in all medias sampled, except air. Three sources of the contamination were observed; 1) industrial wastes disposed in or around the Waste Pit, 2) solid wastes disposed in the general landfill area and, 3) coal mine refuse which were placed in the area before landfilling operations began.

The RI focused on determining if migration of contaminants from the Waste Pit area had occurred by establishing contaminant levels in the background, coal mine refuse, general landfill and the Waste Pit. High levels of heavy metal contamination were found in buried sludges near the Waste Pit as well as in the coal mine spoils. Overall, the study did establish that high levels of contamination, derived from industrial waste disposal activities exist in the waste pit area. There is evidence that contaminants have moved from the waste pit sediments at least as far as monitoring well 4A (refer to Figure 4), about 100 feet east of the waste pit. Contaminants emanating from the waste pit may have moved beyond well 4A, to the vicinity of monitoring well 7A, and even farther, but the evidence is not conclusive.

Migration of contaminants from the waste pit is a concern because these contaminants further degrade groundwater in the area. Groundwater which has migrated through the landfill and coal mine spoil can also be released to surface waters through leachate outbreaks, further degrading surface water quality. Soils which have come in contact with the hazardous wastes disposed at the site and/or leachate emanating from the site have also become contaminated.

Trespassers and people who worked in the active portion of the landfill may have been exposed to site related contamination. King's Run and Little McMahon Creek, which receive drainage water from the site, have been designated as limited resource waters (AMD-impacted) and are vulnerable to contaminant releases from the landfill.

VI. Summary of Site Risks

An Endangerment Assessment (EA), which received extensive U.S. EPA and OEPA input, was conducted in order to determine the extent of the threat to public health and the environment under present and future conditions, and to determine which aspects of the site merit remediation (Buckeye Reclamation Landfill Endangerment Assessment, Buckeye Reclamation Landfill Steering Committee, 1991). The EA assesses health risks by selecting indicator chemicals, evaluating pathways through which the contaminants could come in contact with people, calculating risks then posed by each chemical in each pathway and summing relevant risks for current and future uses of the site. There are two types of risks that contamination from a site may pose to humans, carcinogenic and noncarcinogenic. All people carry a risk of contracting cancer in their lifetime. The EA estimates the excess environmental risks, posed by the site over and above the average risk. Excess upper bound lifetime cancer risks ranging between 10^{-4} and 10^{-6} (one person in ten thousand to one person in one million) are considered acceptable. However, a risk of 10^{-6} will serve as the point of departure for remediation goals for the BRL site. Noncarcinogenic risks are those which cause other illnesses such as impaired organ function, damage to the nervous system, etc. Noncarcinogenic health effects are measured by a "hazard index", which is a calculation of a ratio of exposure to dose at which no effect is seen. If potential exposures to contaminants result in hazard indices which are greater than a value of one, then noncancer health effects may result from exposure.

a. Selection of Contaminants of Concern

As was indicated previously, there are three potential sources of contamination at the Buckeye Reclamation Landfill site. In the Buckeye EA, the hazards/risks attributable to the following contaminants were compared to hazards/risks associated with pre-landfill conditions (conditions which would include contamination levels resulting from coal mine refuse). Twelve contaminants detected in the Waste Pit, soils, leachate, ground water, and surface water were identified as indicator chemicals. Indicator chemicals were chosen based on factors such as the number of times a chemical was detected, the maximum concentration, and persistence and toxicity to human health and the environment. The indicator chemicals listed below account for the majority of health-based risk from conditions at the Buckeye Reclamation Landfill.

Inorganics	Organics
Arsenic	Benzene
Beryllium	Trichloroethene
Lead	Carbon Tetrachloride
Cadmium	1,1-Dichloroethene
Chromium	Carcinogenic PAHs
Nickel	Toluene

b. Assumptions and Constants Used

The toxicity factors for quantification of subchronic, chronic and lifetime hazards for indicator chemicals at the Buckeye site are given in Table 2. Adjusted oral toxicity values for quantification of subchronic, chronic, and lifetime dermal hazards and risks associated with indicator chemicals are given in Table 3. A summary of noncancer hazard/cancer risk calculations for environmental media are provided in Table 4.

c. Baseline Risk Assessment

As part of the EA, a baseline risk assessment was conducted. This evaluation was performed to determine the likelihood of current or future exposures generating adverse health affects, such as cancer. To ascertain the level of remediation warranted at the site, the risk assessment also determined which contaminants and exposure pathways need to be addressed in the remedial action. Table 5 provides the major findings of the EA for the BRL site.

Routes of exposure were identified through which the public and environmental receptors could come in contact with contamination at the site. Both current-use pathways and future-use pathways were examined.

d. Evaluation of Future Risks

Potential future-use exposure routes may evolve if the land upon which the landfill is situated is used for different purposes. As a means of assessing a worst case situation, if no remediation occurs at the site, a future-use scenario was developed in which residential housing was built on site, and residents, including children, were exposed to contaminants. The potential routes of exposure evaluated under these conditions were:

1. ingestion of on-site surface water, groundwater, or off-site residential well water,
2. incidental ingestion of on-site soil,
3. inhalation of VOCs while showering,
4. dermal contact with on-site ground water or off-site residential well water, and
5. dermal contact with on-site soil.

Under the future use scenario, both excess cancer risks and noncarcinogenic hazards were identified. For noncarcinogenic exposures, ground water and surface water utilization are of primary concern. Hazard indices for both average and maximum contaminant concentrations at the BRL site are greater than one, ranging from value of 7.81 to 21.3.

Excess cancer risk estimates were also identified for exposures to site soil, ground water, and surface water. Site related potential cancer risks range from 6.53×10^{-3} to 1.48×10^{-2} for average and maximum chemical concentrations, respectively.

e. Evaluation of Current Risks

Current risks from site related contamination were evaluated. These risks were associated with contaminant exposure to adults and adolescents who go onto the site. Under current conditions at the site, the existing routes of exposure include:

1. incidental ingestion of on-site soil,
2. inhalation of on-site particulates,
3. dermal contact with on-site soils and leachate, and
4. dermal contact with on-site surface water.

None of the existing exposure pathways for the BRL site were associated with noncarcinogenic hazards indices greater than one. Of the existing exposure pathways identified for the BRL site, only the inhalation of fugitive dusts was associated with excess cancer risks. Current use cancer risks range from 3.76×10^{-4} to 1.05×10^{-3} for average and maximum chemical concentrations, respectively.

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f. __Ecological Assessment__

An Ecological Assessment was performed as part of the EA. The objective of the Ecological Assessment was to examine impacts on the local environment, posed by the site. The study also attempted to differentiate effects from acid mine drainage and waste disposal practices on the environment.

The contaminant levels in the soil and surface-water samples downgradient from the site are elevated as indicated by the monitoring results from these media. Acute toxic effects from the contaminants at levels (see Table 1) present (in soil and surface water) may cause death to animals, plants, birds and fish; they may also cause suppressed growth rates/crop yields in plants.

The contaminants present at the BRL site may potentially accumulate in the tissues of plants, fish, shellfish, and animals. Chronic toxic effects on animals and birds include a shortened life span, reproductive problems, lower fertility, changes in appearance and behavior and/or death. The effects on plants are a low growth rate and decreased crop yields.

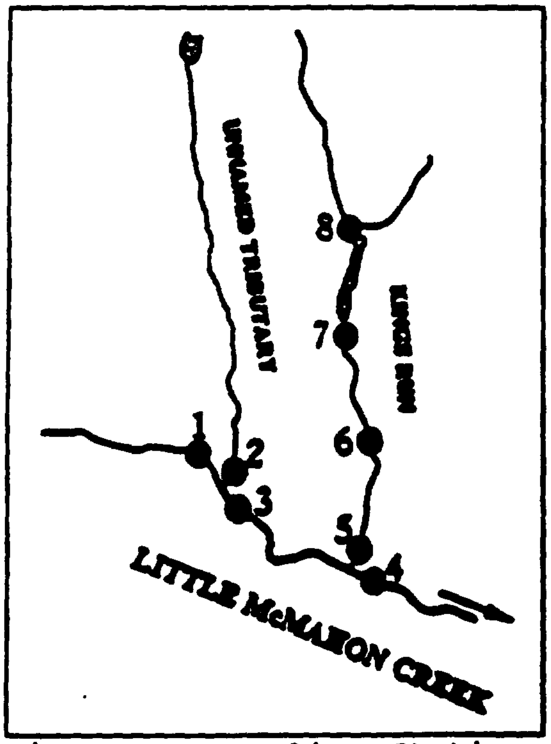

Figure 4. Sampling Stations for the Buckeye Reclamation Biota Survey

Comparison of information concerning potential threatened, rare or endangered species of fauna in Belmont County and data collected in the RI showed no potentially threatened, rare or endangered species or fauna. According to the RI, fauna observed in the area were red fox, whitetail deer, great blue heron, rabbits, possum, eastern gray squirrel, striped skunk, mice, songbirds, and other common bird species.

An Aquatic Biota Survey was also conducted to evaluate the effects of any potential contaminant releases from the site on aquatic organisms present in streams receiving drainage from the site. The survey, explained in the RI, Section 7.0, involved characterization of fish and benthic macroinvertebrate communities. The benthic invertebrate samples examined were dominated by pollution-tolerant groups; and fish species (see below) considered tolerant of pollution were the only species collected at eight stream stations (see Figure 5 for station locations).

All locations surveyed appeared to be impacted; results of both fish and macroinvertebrate surveys demonstrated a pronounced gradient in stream water quality with proximity to the site. Stations 2, 5, and 6 exhibited a scarcity of benthic macroinvertebrates and absence of fish (refer to Table 6). This suggests that the instream environment was extremely poor at these stations, with conditions at Station 2 least favorable for persistence of living organisms.

Fish were captured at five of the eight stations where electrofishing was conducted, including a single creek chub (Semotilus Atromaculatus) from Station 7 just downstream of the impoundment on Kings Run. No fish were collected from Unnamed Run or at the lower two stations on Kings Run (Stations 5 and 6), while fish were most abundant in Little McMahon Creek upstream of the confluence with Unnamed Run and in Kings Run above the impoundment, Stations 1 and 8, respectively.

Four species of fish (representing three families) were taken during stream electrofishing: creek chub, blacknose dace (Rhinichthys atratulus), white sucker (Catostomus commersoni), an apparent Lepomis hybrid between green sunfish (Lepomis cyanellus), and pumpkinseed sunfish (Lepomis gibbosus). Of these, creek chub was the most widespread in distribution while slightly higher numbers of Lepomis hybrids were taken overall. A single white sucker was collected at Station 1, on Little McMahon Creek upstream from the Unnamed Run confluence.

g. Conclusions of the Endangerment Assessment

Table 5 summarizes the results of the Endangerment Assessment. The results of the EA indicate that remediation is needed as current and potential future exposures pose health threats. Current threats result from inhalation of fugitive dust at the site along with incidental ingestion of and dermal contact with on-site soils at the site. Future-use carcinogenic and noncarcinogenic threats may occur from direct contact with and long-term ingestion of surface water, soils, and ground water as well as inhaling VOCs while showering with contaminated water from the site.

Site related impacts on the local environment were assessed. Surveys of larger fauna showed no potentially threatened, rare or endangered species. A macroinvertebrate population survey and fish population survey documented that the site

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was impacting nearby streams and stream beds. Where organisms were present at all, communities were dominated by pollution-tolerant species. Monitoring data, however, was unable to distinguish between impacts on the environment posed by waste disposal practices at the site or acid mine drainage emanating from the site.

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision, may present imminent and substantial endangerment to public health, welfare and the environment.

VII. Description of Alternatives

Alternatives for the remediation of the Buckeye Reclamation Landfill site have been evaluated in a Feasibility Study (FS), which is available for review by the public at the St. Clairsville Public Library and at the Neffs Branch of the Martins Ferry Public Library. The Feasibility Study (FS) was conducted to identify and screen technologies and alternatives for addressing the contamination problems at the site (Feasibility Study, Buckeye Reclamation Landfill Steering Committee, April, 1991). The Endangerment Assessment concluded that three significant exposure and contaminant routes exist for the Buckeye Reclamation site. These routes are:

* Dermal contact / inhalation / ingestion of surface soils
* Migration of contaminants from surface and subsurface soils into ground water / surface water
* Ingestion of contaminated ground water / surface water.

The following media, therefore present an existing or potential future threat to public health and the environment:

* Surface / Subsurface Soils
* Ground Water / Surface Water

The Feasibility Study evaluates methods to meet remedial action goals which, based upon the EA, are to protect public health and the environment from contaminants in soils and surface/ground water. This can be accomplished by limiting direct physical contact with the contaminated soils to reduce the threat of dermal contact, inhalation, and ingestion of soils and to restore the surface/ground water to a useful, less threatening state by reducing the levels of the contaminants present. Site investigations show that most ground water originating in aquifers under the Buckeye Reclamation site migrates laterally into the coal mine refuse and is eventually discharged as leachate to Kings Run. In effect, most site groundwater becomes surface water before it leaves the site. Therefore, groundwater and surface water may be treated under a single remedial action objective.

The initial screening included four alternatives which were evaluated against effectiveness, implementability, and cost. Three of the original four alternatives were evaluated in detail in the Feasibility Study, Alternatives 1,3 and 4. Alternative 2, which consisted of monitoring and institutional controls, did not meet remedial action objectives, therefore it was not carried through detailed analysis. Alternative 1, the no-action alternative, does not comply with Applicable and Relevant or Appropriate Requirements (ARARs - pertinent environmental regulations), however it is retained as a statutory requirement for baseline comparison to other alternatives. The other two alternatives each incorporate treatment of leachate and ground water as a portion of the remedy. Two methods of leachate treatment were examined; Option A - Chemical Treatment and Option B - Constructed Wetlands for each of the remaining alternatives.

Under Option A, a surface leachate seep and ground water underdrain collection system shall discharge into an aeration pond where aeration of carbonates and bicarbonates shall reduce lime requirements for precipitation and also remove any volatile organic compounds present. Water from the aeration basin would then be transferred to a settling basin through a channel, where a lime slurry would be added. The settling pond would have sufficient residence time to allow settling of the metal hydroxides, calcium sulfate formed from reaction between the lime feed and sulfates in the water, and suspended total solids. Treated water from the settling pond would discharge into Little McMahon Creek through a riprap-lined channel.

Under Option B, the surface leachate seep and ground water underdrain system would discharge into a riprap lined channel at the southern end of the landfill cap which would in turn discharge to a constructed wetlands. The channel will be lined with limestone riprap to assist in pH adjustment. The wetlands size will be from 9 - 18 acres. The envisioned design includes construction of a maximum of six cells, each approximately 3 acres in size. Each cell would have a 1 -foot base of compacted clay, a geomembrane, sand, crushed limestone, and one foot of spent mushroom compost or other suitable substrate which will be seeded or mulched to establish cattails and other wetland vegetation. Flow paths would be established using hay bales to maximize the effective retention time and avoid channelization or short-circuiting of the cells. Bacteria driven chemical reactions in the wetlands will cause iron and other metals and chemicals of concern to drop out of solution and lower the acidity of the water. This is accomplished by creating a sulfate reducing environment. Since the leachate has a high

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concentration of sulfate, generation of sulfide in an anaerobic environment is assured. Under these conditions, iron sulfide (FeS) precipitation should also remove arsenic as an arsenide. With the rise in pH to above 6, aluminum hydroxide ($Al(OH)_3$) will precipitate and this will also positively affect the removal of beryllium either as an hydroxide or an adsorbed species. Treated water from the constructed wetland treatment system would be discharged to Little McMahon Creek.

Wetlands treatment of a mixture of landfill leachate, acid mine drainage and ground water is an innovative technology. Treatability studies are being performed to assess the effectiveness of the wetlands treatment method. The object of the treatability studies is to determine if levels of contaminants of concern, mainly metals, can be lowered to meet discharge limits.

All alternatives are summarized below:

Alternative 1 - No Action

Estimated Capital Cost:	$ 0
Estimated Present Worth:	$ 0
Estimated Annual O&M Cost:	$ 0
Estimated time to Implement	none

The No Action Alternative is a no cost alternative that is required to be retained through the detailed analysis of alternatives stage by the National Contingency Plan (NCP). Under a No Action Alternative, no remediation or maintenance of the site would be performed whatsoever. The site would remain in its current state. The No Action Alternative can therefore be used as a baseline for comparison to the other alternatives developed.

Alternative 3A - Fully RCRA Compliant, Subtitle C Cap with Chemical Treatment

Estimated Capital Costs:	$184,745,000
Estimated Present Worth Cost:	$196,913,000
Estimated Annual O&M Cost:	$ 834,000
Estimated Time to Implement:	30 months

Alternative 3A involves the following major components:

* RCRA Compliant, Hazardous Waste Cap
* Institutional controls
* Fencing
* Ground water collection
* Surface leachate seep collection
* Ground water monitoring

* Surface leachate seep monitoring
* Monitoring of Kings Run
* Leachate/ground water Treatment by Neutralization/ Precipitation (Option A)

Alternative 3A utilizes a full RCRA cap to contain the entire site. The cap will eliminate direct contact with contaminated soils, reduce infiltration of rainwater, and minimize the formation of acid mine and leachate drainage. A RCRA cap consists of the following layers, from bottom to top: a grading layer, a minimum of two feet of relatively impermeable clay covered with a geomembrane (rubberized sheet), at least one foot of sand, and two feet of soil for establishing vegetation. Slopes for a full RCRA cap must be 2% to 5%. The slope requirements would result in Kings Run being culverted under fill materials. Alternative 3A uses the chemical treatment system to treat leachate and ground water collected in the underdrain collection system. This alternative also includes institutional controls on what the property may be used for in the future, installing a fence around the site, and periodic sampling of ground water to monitor contaminant migration.

<u>Alternative 3B - Fully RCRA Compliant Cap with Wetlands Treatment</u>

Estimated Capital Cost:	$191,227,000
Estimated Present Worth:	$193,084,000
Estimated Annual O&M Cost:	$ 153,000
Estimated Time to Implement	30 months

The major components of alternative 3B are:

* RCRA Compliant Hazardous Waste Cap
* Institutional controls
* Fencing
* Ground water collection
* Surface leachate seep collection
* Ground water monitoring
* Surface leachate seep monitoring
* Monitoring of Kings Run
* Leachate/ground water Treatment by Constructed Wetlands (Option B)

Alternative 3B utilizes the same type of RCRA cover system and underdrain collection system as 3A above, except alternative 3B uses constructed wetlands to treat the collected leachate and ground water. All other components are the same as 3A.

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<u>Alternative 4A - Solid Waste (Standard) Landfill Cap with Chemical Treatment</u>

Estimated Capital Cost:	$ 40,447,000
Estimated Present Worth:	$ 52,492,000
Estimated Annual O&M Cost:	$ 780,000
Estimated time to Implement	18 months

The major components of Alternative 4A are:

* Solid Waste Landfill Cap
* Institutional controls
* Fencing
* Ground water collection
* Surface leachate seep collection
* Ground water monitoring
* Surface leachate seep monitoring
* Monitoring of Kings Run
* Leachate/ground water Treatment by Neutralization/ Precipitation (Option A)

This alternative consists of a solid waste landfill cap which should have a final slope of 5% to 25%. Ohio Solid Waste Regulations for closure of a solid waste landfill were used to develop this alternative. A solid waste cap consists of two feet of impermeable clay, a one foot minimum drainage layer of sand, and a vegetated top layer with a minimum thickness of two feet. Kings Run will remain in place and the western bank will be lined with riprap to control erosion. A leachate and ground water collection system will be installed to intercept acid mine drainage (AMD) and leachate from the landfilled areas and channel it to the treatment system. The AMD and leachate will be treated with hydrated lime in the treatment system. Also included in this option are institutional controls on future property use, installing of a fence around the site, and ground water monitoring for contaminant migration.

<u>Alternative 4B - Solid Waste (Standard) Landfill Cap with Wetlands Treatment</u>

Estimated Capital Cost:	$ 46,923,000
Estimated Present Worth:	$ 48,663,000
Estimated Annual O&M Cost:	$ 99,000
Estimated time to Implement	18 months

The major components of Alternative 4B are:

* Solid Waste Landfill Cap
* Institutional controls
* Fencing
* Ground water collection

* Surface leachate seep collection
* Ground water monitoring
* Surface leachate seep monitoring
* Monitoring of Kings Run
* Leachate/ground water treatment by constructed wetlands (Option B)

Alternative 4B is the same as 4A except AMD, leachate and ground water collected by the underdrain system will be treated by the constructed wetlands. All other components are similar.

VIII. Summary of Comparative Analysis of Alternatives

The remedial alternatives developed during the Feasibility Study were evaluated by the U.S. EPA using the following nine criteria. The advantages and disadvantages of each alternative were then compared to determine which alternative provided the best balance among these nine criteria. These criteria are set forth in the National Contingency Plan, 40 CFR Part 300.430.

1. Overall protection of human health and the environment addresses whether or not a remedy provides adequate protection, and describes how risks are eliminated, reduced or controlled through treatment, engineering controls, or institutional controls.

2. Compliance with ARARs addresses whether or not a remedy will meet all of the applicable or relevant and appropriate requirements (ARARs) of other environmental statutes and/or provide grounds for invoking a waiver.

3. Long-term effectiveness and permanence refers to the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been met.

4. Reduction of toxicity, mobility, or volume is the anticipated performance of the treatment technologies a remedy may employ.

5. Short-term effectiveness involves the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

6. Implementability is the technical and administrative feasibility of a remedy, including the availability of goods and services needed to implement the chosen solution.

7. Cost includes capital and operation and maintenance costs.

8. State agency acceptance includes whether, based on its review of the RI/FS and Proposed Plan, the State agency (OEPA) concurs, opposes, or has no comment on the preferred alternative.

9. Community acceptance will be assessed in the Record of Decision following a review of the public comments received on the RI/FS Report and the Proposed Plan.

Each alternative was evaluated against these nine criteria. The selected alternative is Alternative 4B, a standard, or solid waste landfill cap, with wetlands treatment of collected leachate, acid mine drainage and ground water. A discussion of how the alternatives compare to each other based upon these criteria follows.

Criterion 1. Overall Protection of Human Health and the Environment

All of the remedial alternatives considered for the Site, except for the no action alternative and the institutional controls alternative, are protective of human health and the environment. This protection is achieved by eliminating, reducing or controlling risks through combinations of treatment, engineering controls and institutional controls. As the no-action alternative and Alternative 2, the institutional controls alternative, do not provide protection of human health and the environment, they are not eligible for selection and shall not be discussed further in this document.

Alternatives 3 and 4 would provide protection to trespassers on site because the landfill caps would cover contaminated soils thus eliminating exposure to the soils. Collection of landfill leachate, ground water and acid mine drainage would eliminate uncontrolled releases of contaminants to the environment, thereby minimizing the chance of exposure. Treatment of the leachate, groundwater, and acid mine drainage will convert contaminants in these liquids to more stable forms and remove the contaminants from solution.

Criterion 2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

Section 121 (d) of SARA requires that remedial actions meet legally applicable or relevant and appropriate requirements (ARARs) of other environmental laws. These laws may include: the Resource Conservation and Recovery Act (RCRA), the Clean Water Act (CWA), the Clean Air Act (CAA), the Safe Drinking Water Act (SDWA), and any state law which has more stringent requirements than the corresponding Federal law. "Legally applicable" requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstances at a CERCLA site. "Relevant and appropriate" requirements are those requirements that, while not legally applicable to the remedial action, address problems or situations sufficiently similar to those encountered at the site that their application is well suited to the remedial action.

Non-promulgated advisories or guidance documents issued by federal or state governments do not have the status of ARARs; however, where no applicable or relevant and appropriate requirements exist, or for some reason may not be sufficiently protective, non-promulgated advisories or guidance documents may be considered in determining the necessary level of clean up for protection of human health and the environment.

Several specific ARARs are discussed below.

a) Resource Conservation and Recovery Act (RCRA). RCRA characteristic wastes (corrosive; D002 and EP Toxic) were disposed in a limited portion of the Buckeye Reclamation Landfill (BRL) site, prior to 1980. U.S. EPA is implementing a waiver of RCRA landfill closure requirements pursuant to CERCLA Section 121(d)(4)(C) and (D) and 40 CFR 300.430(f)(1)(ii)(C), due to the steepness of the slopes present at the BRL site. Sections 121(d)(4)(C) provide U.S. EPA authority to waive a requirement when "compliance with such requirement is technically impracticable from an engineering perspective". Slope requirements for the subtitle C cap cannot be reasonably implemented at this site because filling the valley would be required and Kings Run would be diverted through pipes under the cap. Inasmuch as the subtitle C cap is technically impracticable, from both an engineering and reliability perspective, a waiver of the RCRA closure requirements pursuant to CERCLA 121(d)(4)(D) is also justified. This section provides U.S. EPA authority to waive a requirement when "the alternative will attain a standard of performance that is equivalent to that required under the otherwise applicable standard, requirement, or limitation through use of another method or approach". A subtitle C cap at the BRL site is technically impracticable and a solid waste cap will attain a standard of performance equivalent to or greater than RCRA cap requirements for the following reasons:

1) The steep slopes of the area to be capped at the Buckeye Reclamation Landfill will have to be

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reduced significantly (to 2-5%) in order to construct the RCRA cap. If it is not possible to decrease the slopes to this level, cover materials placed over the synthetic liner, which is required for a RCRA cap, may become unstable when saturated and contribute to synthetic liner failure and possible subsequent cap failure. Since the solid waste cap can be implemented over steeper slopes (5-25%) and does not require such liners, the likelihood of a solid waste cap failure at this site is significantly decreased. Therefore, the solid waste cap requirements are likely to result in improved performance of the remedial action.

2) Implementation of the RCRA cap will require excavation of large volumes of waste material in order to meet RCRA slope requirements. The excavation of waste will increase the likelihood of human exposure to hazardous substances. Since the solid waste cap can be implemented over steeper slopes, a much lower volume of waste will have to be excavated during remedial construction. Thus, implementation of the solid waste cap will achieve enhanced performance from the perspective of overall control of risk.

3) Implementation of the RCRA cap will require culverting Kings Run under the cap. Allowing water to flow under the cap will increase the potential for infiltration of such water into the capped waste material (potentially increasing the amount of ground water contamination and leachate production). However, the solid waste cap can be implemented without culverting Kings Run. Therefore, the solid waste cap will decrease the potential for increased infiltration, contaminant migration, and leachate production from the culverted stream.

b) Ohio Administrative Code (OAC) 3745-27-11, Final Closure of Sanitary Landfill Facilities. The selected remedy will meet or exceed the requirements of this rule by installing the specified cap and surface water diversion controls. The cap shall be installed over all areas where waste disposal occurred and up gradient areas which could act as recharge zones to site ground waters. The impermeable layer of the cap must not exceed $1x10^{-7}$ cm/sec. permeability and the layers must meet the minimum thickness requirements.

c) OAC 3745-27-10, Ground Water Monitoring Program. The selected remedy includes a ground water monitoring program which will assure no contaminants are leaving the site. Points of ground water compliance are considered to be the landfill boundaries.

d) OAC 3745-27-14, Post Closure Care of Sanitary Landfill Facilities. Post closure care will continue for a minimum of 30 years after the closure date. Post closure care involves leachate collection and management, surface water management, ground water monitoring, regular inspections of the cap for erosion, subsidence, and/or settlement, and periodic maintenance such as repair of any erosion damage to the cap or any of the drainage channels from surface water runoff.

e) Ohio Revised Code (ORC) Chapter 6111, Water Pollution Control Law. Treatment of the collected leachate and ground water will restore the quality of waters leaving the site in accordance with this law.

f) National Pollutant Discharge Elimination System (NPDES). The treatment system is expected to be located on-site, or in near proximity to the site. Consequently, the administrative requirements of an NPDES Permit and Permit-To-Install need not be met. However, substantive requirements such as design standards and effluent discharge limits must be adhered to. Interim limits for the wetlands discharge have been calculated based on water quality standards (see Attachment A). These limits may be made more stringent based upon the performance of the wetlands system. Should the treatment system be located off-site, the full NPDES Permit and PTI will be required.

g) Any sludge generated by the chemical/physical treatment system or the wetlands treatment system, whether the system is located on-site or off-site, will need to be evaluated pursuant to OAC 3745-52-11 as a potential hazardous waste.

Criterion 3. Long-term Effectiveness and Permanence

Capping is a reliable technology for isolating contamination from the surface environment and minimizing infiltration of precipitation. With infiltration minimized, leachate generation should be minimized. The RCRA multi-layer cap will require more involved inspection and maintenance to assure long-term performance. The RCRA cap would also cover a portion of Kings Run, because of the slope requirements. Kings Run would then be channeled through culverts under the cap. This would result in loss of some surface water wildlife habitat and involve complicated inspection and maintenance of the culverts. Wetlands treatment of the collected leachate/groundwater should prove more effective over the long term because, once established, the wetlands should be a self contained system. Bacteria in the anaerobic substrate should reproduce, feeding on the inflow of sulfate-rich leachate. With the site capped and leachate generation from the site decreasing, required capacity for the wetlands treatment should also decrease. In effect, long-term effectiveness of the wetlands treatment should increase with time. Any combination of the above alternatives will increase water quality in the area of the site, which will benefit surface water wildlife habitats.

Criterion 4. Reduction of Toxicity, Mobility or Volume Through Treatment

Alternatives 3 and 4 will both include treatment of collected leachate/ground water. Either of the two treatment options will reduce the mobility of the contaminants of concern by converting the compounds to a more chemically stable species. By physically eliminating discharges to Kings Run with the leachate/ground water collection system, the total volume of contaminated waters will be greatly decreased. Capping the site will minimize leachate generation as water-bearing zones under the site dewater.

Options for treating waste pit soils, including incineration and solidification/stabilization, were evaluated in the Feasibility Study. Both treatment options were eliminated during the phase two screening process due to the types of contaminants which are present in the soils, difficulties in implementing the treatments, short-term health risks involved in digging up the contaminated soils and the high cost versus little overall environmental benefit of treatment. Incineration effectively destroys organic contaminants but leaves metals in the ash, which would require further treatment before disposal. Solidification/stabilization would immobilize the metal contaminants but may not address the organic contaminants. Based on the above factors, the Agency determined that treatment of the waste pit soils would not be part of the remedy for the BRL site.

Criterion 5. Short-term Effectiveness

The standard or solid waste landfill cap proposed in Alternative 4 requires far less earth moving activities (approximately 1.3 million cubic yards) and an estimated 18 months for construction. Alternative 3, the RCRA cap, involves extensive earth moving activities (approximately 11 million cubic yards) and an estimated 30 months for construction because of the 2% to 5% slope requirement. Each of the cap types will likely use some cut and fill of landfilled areas to meet slope requirements, however, the standard cap requires less excavation and time, decreasing the amount of exposure to contaminated soils. Installation of the RCRA cap would cover the northern portions of Kings Run, therefore necessitating culverting those portions of the stream. This would require more extensive surface water runoff management because surface runoff would need to be routed to the southern portions of Kings Run where it is not culverted. The implementation of the preferred alternative utilizing the leachate/ground water collection with either water treatment option A or B is not expected to have a significant detrimental impact on the environment. It should produce an immediate environmental benefit by significantly reducing or eliminating the quantity and concentration of the contaminated waste/leachate that is currently being released to local surface waters.

Criterion 6. Implementability

Each of the alternatives considered is implementable. The technologies of excavation and capping have been well proven, and have been extensively practiced on hazardous waste sites in the past. Alternative 4 is more readily implementable because less culverting and diverting of streams is involved and less earth/waste movement will be necessary. The proposed ground water and surface leachate seep collection technologies are readily implementable at the BRL site. Implementation of the ground water and surface leachate seep treatment by precipitation/ neutralization can also be readily implementable. Sufficient area is available for the construction of this option. As wetlands treatment requires more space (approximately 9-18 acres), site topography needs to be carefully evaluated during the remedial design phase. A treatability study is currently being conducted to evaluate the effectiveness of the wetlands treatment for removal of the contaminants of concern.

Implementation of Alternative 3 would be expected to take a minimum of 30 months whereas Alternative 4 would take 18 months. Construction schedules could be delayed based on weather conditions as well as construction-related factors.

Criterion 7. Cost

Alternative 4 costs are estimated to range from $52,492,000 to $48,663,000, with option A or B, respectively. Alternative 4B is the least expensive remedy which is protective of human health and the environment and meets ARARs. The cost of Alternative 3 ranges from $196,913,000 to $193,084,000 with treatment option A or B, respectively.

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full Responsiveness Summary to all comments received by U.S. EPA is attached.

IX. Selected Remedy

The selected Alternative, detailed description

The selected alternative at the Buckeye Reclamation Landfill Site is Alternative 4B, which involves the following:

* Solid Waste Landfill Cap
* Institutional controls
* Fencing
* Ground water collection
* Surface leachate seep collection
* Ground water monitoring
* Surface leachate seep monitoring
* Monitoring of Kings Run
* Leachate/ground water treatment by constructed wetlands (Option B)

Details on each component of the alternative are given below. The remediation goals for this selected alternative were based on current and potential future-use risks posed by the site which were developed in the BRL Endangerment Assessment. State of Ohio solid waste closure regulations were also considered in selecting this alternative.

Solid Waste Landfill Cap

This alternative involves leaving the waste pit material in place and covering the entire landfilled area, the waste pit, and suspected sources of recharge for the waste pit and water-bearing zones potentially in contact with it with a solid waste landfill cap (Figure 6). The purpose of the cap would be to minimize infiltration of precipitation through the landfilled material, minimize human and animal contact with the landfilled material, control surface flushing of acid-producing material by air and water erosion. The cap will also minimize contamination of surface water runoff and the dispersion of hazardous wastes and contaminated surface soil by wind. This alternative requires limited cut and fill volumes and fewer cap materials. A solid waste cap is preferred over a cap with a geomembrane because, for the site conditions at Buckeye, it would be as protective of human health and the environment, more stable on the steeper slopes and less costly to construct, inspect and maintain.

A solid waste landfill cap (Figure 6) consists of a vegetated top cover, a middle drainage layer, and low permeability layer. The material constituting the low permeability layer must not exceed

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Criterion 8. State Acceptance

The Ohio Environmental Protection Agency (Ohio EPA) has been closely involved with the development and review of all aspects of the Remedial Investigation, Feasibility Study, Endangerment Assessment, and all related documents for this Site as a Party to the AOC under which the RI/FS was performed. The Ohio EPA has also been closely involved in the remedy selection process. The Proposed Plan was issued as a joint proposal of the U.S. EPA and Ohio EPA.

A letter from the Director of the Ohio EPA indicating Ohio EPA's concurrence on this Record of Decision has been received by the U.S. EPA.

Criterion 9. Community Acceptance

Written comments received during the public comment period and oral comments taken during the Proposed Plan public meeting have been considered by the U.S. EPA.

Several members of the community expressed concerns that the cost of the proposed remedy would raise their taxes and/or bankrupt companies responsible for the cleanup. Other members of the community were not convinced that the site actually posed a health risk, therefore stating that any remedial costs were not justified. Comments submitted by the PRP group which conducted the RI/FS under the Agencies' oversight stated that several assumptions used in the Endangerment Assessment were overly conservative. All of the public comments received are addressed in the Responsiveness Summary which is attached to this Record of Decision (ROD).

After considering public comments, the U.S. EPA determined that public health and the environment are at risk from site related contamination. Therefore, public health and the environment would be better served by finalizing the ROD in its present form so that implementation of the remedy could begin.

In summary, the U.S. EPA has determined that the selected alternative provides the best balance with respect to the nine criteria used to evaluate remedies. Based upon the information available at this time, therefore, the U.S. EPA and the OEPA believe that the selected alternative would protect human health and the environment, would comply with ARARs as qualified above, would be cost-effective, and would utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. The selected alternative will satisfy the statutory preference for treatment as a principal element by utilizing wetlands treatment of collected leachate and ground water. A away from the cap to protect it from erosion. North-south berms will be constructed at all major slope breaks on the cap. The berms will control the surface water runoff on the cap, therefore minimizing erosion.

Post closure care for the cap will continue for a minimum of 30 years after the closure date as outlined in OAC 3745-27-14. Post closure care involves leachate collection and management, surface water management, ground water monitoring, regular inspections of the cap for erosion, subsidence, and/or settlement, and periodic maintenance such as repair of any erosion damage to the cap or any of the drainage channels from surface water runoff.

Surface Leachate Seep and Ground Water Collection System

A leachate and ground water collection system will be installed to intercept acid mine drainage (AMD), leachate and ground water from the landfilled areas and channel it to the treatment system. This collection system will prevent AMD and leachate from collecting under the cap and discharging into Kings Run. The collection system is envisioned to consist of combined underdrains and french drains that will be installed around the site perimeter and at existing and newly-identified leachate seeps. Specifics of the leachate and ground water collection system requirements will be determined during a predesign ground water study of the site. This additional hydrogeologic investigation will also be necessary to provide further data on the extent of ground-water contamination and to determine the potential for contaminated ground water to discharge beyond the proposed collection drain.

Treatment of Collected Waters with Constructed Wetlands

Constructed wetlands are the method of treating acid mine drainage and leachate preferred by U.S. EPA and OEPA (see Figure 7) at the BRL site. Wetlands are preferred over chemical treatment because they reduce operation and maintenance (O&M) costs, will have less impact on the surrounding area, and have proven effective at acid mine drainage reclamation projects in Ohio. The goals of the treatment system are to raise the pH of the collected waters and reduce the levels of contaminants of concern to acceptable levels prior to discharge. Interium discharge limits and a monitoring program for waters discharged from the constructed wetlands treatment system are presented in Attachment A. Treatability studies are underway to test how effectively the wetlands will remove contaminants of concern and to optimize the performance of the system. If the studies conclude wetlands do not adequately remove the chemicals, construction of the chemical/physical treatment system will be required.

The surface leachate seep and ground water collection system will

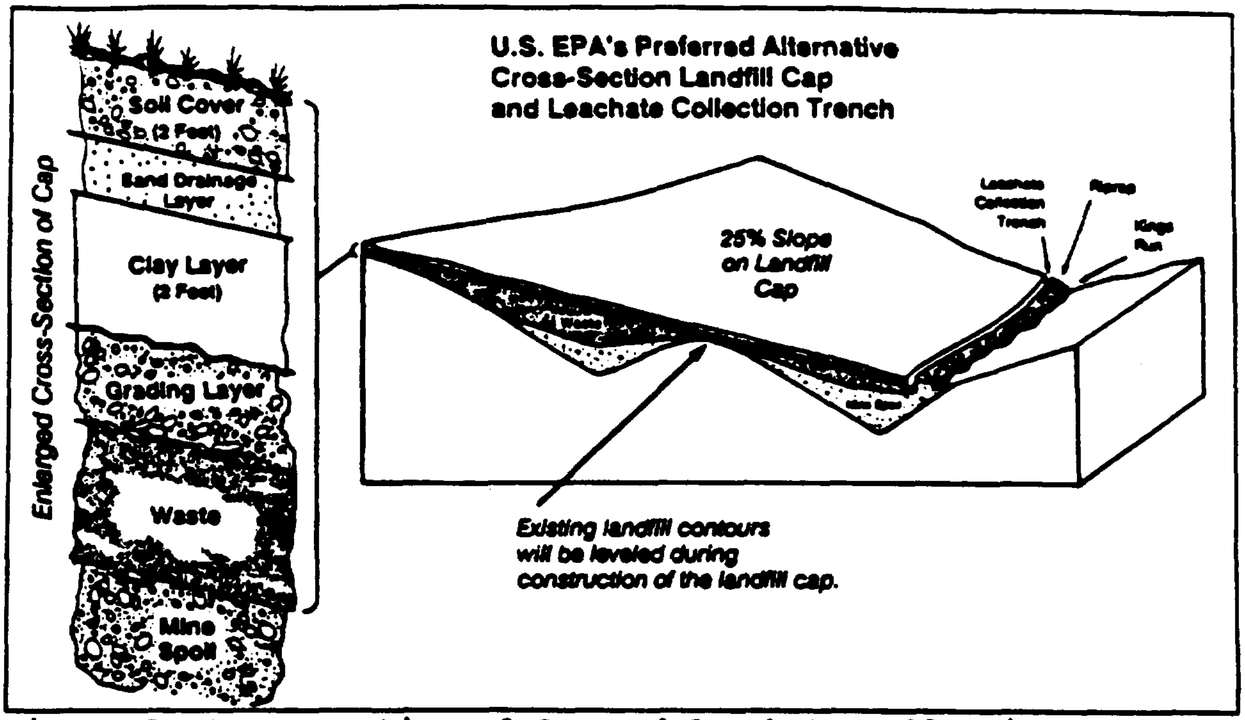

Figure 5. Cross-section of Cap and Leachate Collection System

10^{-7} cm/sec. permeability. This design for a solid waste landfill cap is specified by the Ohio Administrative Code (OAC) 3745-27-11. All solid waste landfills in Ohio must be closed in accordance with this regulation. The vegetated top layer will have a minimum thickness of two feet and consist of topsoil that can support vegetation. A well-mixed cover of grasses and legumes such as Kentucky bluegrass, clover, and red top will provide dense root system to anchor the soil and minimize wind and water erosion. The drainage layer is located directly below the vegetated top layer and has a minimum thickness of one foot. The low permeability layer will consist of a low permeability soil with a minimum thickness of two feet. This low permeability soil layer minimizes the amount of infiltration to the capped material.

To protect the west bank of Kings Run from further erosion and preserve the integrity of the cap, the west bank will be lined with a layer of stones called riprap. The channel will be lined with an 18 inch blanket of graded riprap (around 12 inches in diameter) that will extend approximately 7 feet up the west bank of Kings Run and along the stream bottom. A non-woven geotextile will be installed between the soil and the riprap to minimize soil movement into or through the riprap.

Drainage channels will be installed to the north and west of the cap to collect surface water runoff from the cap and divert it

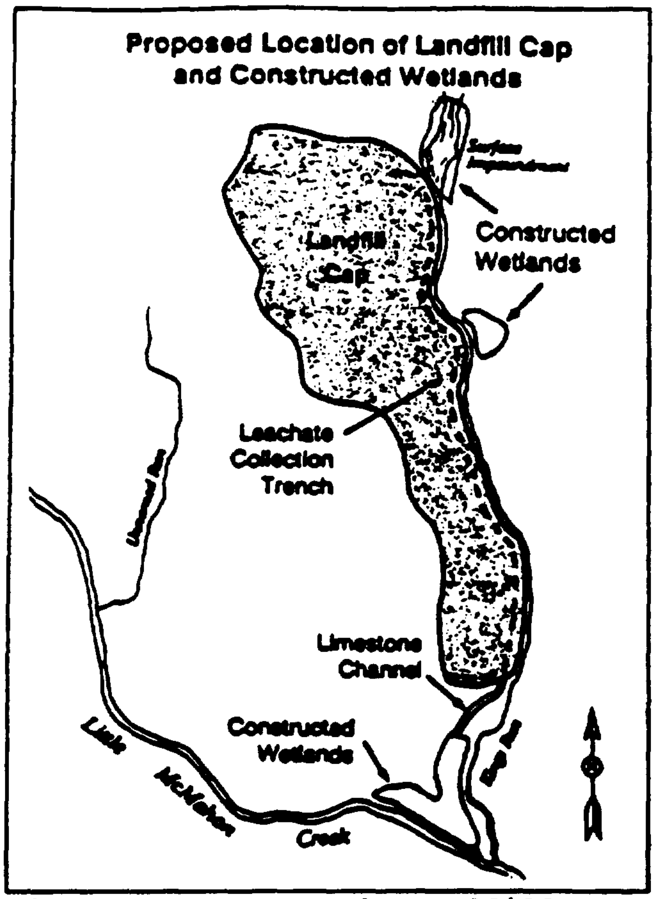

Figure 6. Proposed Landfill Cap and Constructed Wetlands

discharge into a riprap-lined (limestone) channel at the southern end of the landfill cap for the purpose of aerating the leachate. The limestone riprap may also act as a pretreatment to neutralize the leachate.

The riprap lined channel will then discharge to a wetland with up to six, 3 acre ponds, resulting in a total size up to 18 acres. Each wetland will have a one foot base of compacted clay overlain by a geomembrane to minimize the loss of treatment waters into the underlying soil. The geomembrane liner is overlain by six inches of sand, then one foot of crushed limestone aggregate. The limestone is then covered with one foot of spent mushroom compost, or other suitable substrate, which is seeded or mulched to establish cattail and other wetland vegetation growth. The clean water resulting from the constructed wetlands treatment will be discharged into Little McMahon Creek. Testing of landfill leachate will be used to refine design specifics of the constructed wetlands. Wetland cells may require dredging if sediments and/or sludge accumulates to the point that treatment effectiveness is decreased. The dredged materials shall be tested to determine the proper method of disposal. Once a cell has been dredged, it shall be reconstructed to the original specifications.

Monitoring and Institutional Controls

Other components of the preferred alternative include monitoring, fencing and possible institutional controls. Ground water monitoring wells will be sampled periodically to assure that no contamination is moving off of the site. If excess levels of contaminants are identified, future actions may be necessary to address ground water problems. Surface leachate seeps will be sampled to monitor contaminant levels in the landfill and monitoring Kings Run will detect any possible discharges to that stream. A fence will be installed around the perimeter of the landfill to limit trespassing. Institutional controls limiting the development of the property and the placement of new wells on the property and adjacent to the site may be sought voluntarily from owners or compelled to the extent authorized under any applicable local and state laws. In the event that institutional controls are not implemented, the selected remedial action will be re-evaluated to determine if additional actions should be implemented to ensure that the remedy is permanent and effective on a long term basis.

Treatability Study and Additional Hydrogeologic Study

The first phase of treatability study has begun to evaluate the effectiveness of wetlands treatment of waters typically emanating from the Buckeye Reclamation Landfill site. The first phase involves a laboratory or screening scale study in which leachate collected from the Buckeye Reclamation site is introduced to different combinations of substrates under both aerobic and anaerobic conditions. Analyses of the liquid both before and after treatment, in addition to monitoring the samples for hydrogen sulfide generation and color changes, will provide information on which combination of substrates and conditions are more effective. Once the first phase is complete, larger scale studies will be required during the remedial design. These studies may be comprised of longer term laboratory testing and/or small scale test systems constructed on the Buckeye Reclamation Landfill site. If treatability studies indicate that the wetlands will not effectively remove contaminants, chemical/ physical treatment will be required.

Additional hydrogeologic studies will be performed during the remedial design of the selected remedy. The objective for these studies is to refine data on ground water flow directions in water bearing zones under the site, to better define locations of the water table, and to provide additional information on the extent of site related contamination. This information is required for proper design of the ground water and surface leachate seep collection system.

Performance Standards and Clean-up Goals

Performance standards for the solid waste landfill cap are taken from the Ohio solid waste regulations (OAC-3745-27-11). Permeability of the low permeability (clay) layer shall not exceed 1×10^{-7} centimeters per second. Permeability of the drainage layer shall be 1×10^{-3} centimeters per second at a minimum. Thicknesses of the cap layers shall meet the minimum requirements specified in the regulations. All surface water management structures shall be designed and constructed to meet the Ohio solid waste closure requirements.

Design, construction, and operation of the wetlands treatment

3

system must meet the substantive requirements of appropriate Ohio permits. Contaminants in waters discharged from the wetlands treatment system to Little McMahon Creek shall not exceed the interim discharge limits shown in Attachment A. More stringent concentration limits may be required if proven attainable during Remedial Design/Remedial Action.

Cost

The approximate costs of the selected remedy are provided below:

Estimated Capital Cost:	$ 46,923,000
Estimated Present Worth:	$ 48,663,000
Estimated Annual O&M Cost:	$ 99,000

Timeframe for Implementation

The estimated amount of time required for construction of this remedy is 18 months. This construction schedule is heavily dependent on weather conditions and construction considerations such as availability of materials and equipment. Negotiations for performance of the Remedial Design will require four months and design will require one year at a minimum. Therefore, construction of the remedy should be completed approximately three years after the Record of Decision is signed.

The wetlands will need to function as a long-term treatment system. Volumes of collected leachate and ground water will decrease once the cap is in place, but the treatment period will likely be in excess of 30 years.

X. Statutory Determinations

The following is a brief description of how the selected remedy meets the statutory requirements of Section 121 of CERCLA.

Protection of Human Health and the Environment.

The Endangerment Assessment which was developed for this site concluded that three significant exposure and contaminant routes exist for the Buckeye Reclamation site. These routes are:

* Dermal contact / inhalation / ingestion of surface soils
* Migration of contaminants from surface and subsurface soils into ground water / surface water
* Ingestion of contaminated ground water / surface water.

The following media, therefore present an existing or potential threat to public health and the environment:

- Surface / Subsurface Soils
- Ground Water / Surface Water

Implementation of the selected remedy will reduce and control potential risks to human health and the environment posed by exposure to these two media. Contaminated surface and subsurface soils will be covered by the landfill cap, thereby eliminating the direct exposure route. Institutional controls that may be placed on the property will specify future use limitations for the site area. Contaminated discharges from the landfill will be intercepted by the surface leachate seep and ground water collection system, thus improving the local surface water quality. Risks presented by the ground water and surface waters will be reduced by treating the waters in the constructed wetlands. Surface and ground water clean-up levels for the treatment system are listed in Attachment A. Once remedial action is underway, any risk posed by the site will fall within the cumulative risk range of 10^{-4} to 10^{-7} for carcinogenic compounds and so that the cumulative hazard indices for non-carcinogens will be less than one. Implementation of the selected remedy will not pose unacceptable short-term risks or cross-media impacts.

<u>Compliance with Applicable or Relevant and Appropriate Requirements</u>.

The selected remedy is designed to meet all applicable or relevant and appropriate requirements (ARARs) of Federal and State statutes in accordance with Section 121(d) of CERCLA, except where it will be necessary to obtain waivers. CERCLA Section 121(d) allows for selection of a remedy that does not attain ARARs under limited circumstances. The waiver of the RCRA closure standard ARAR at the Buckeye Reclamation Landfill site is justified because "compliance with such requirements is technically impracticable from an engineering perspective" and "the remedial action selected will attain a standard of performance that is equivalent to that required under the otherwise applicable standard, requirement, criteria, or limitation, through use of another method or approach".

The Federal ARARs include RCRA (40 CFR Part 260-271), the Safe Drinking Water Act (40 CFR Section 141.11 and .12), the Clean Water Act (40 CFR Parts 122, 125 and 131), and the Clean Air Act (40 CFR Parts 50, 60 and 61). State ARARs include the Ohio Revised Code Chapter 6111 and 3734.

The following specific ARARs will be met by the selected remedy:

<u>Surface Water</u>

Substantive requirements of Ohio Revised Code (ORC) Chapter 6111, the National Pollutant Discharge Elimination System (NPDES) and toxicity, mobility or volume achieved through treatment, short-term effectiveness, implementability, the statutory preference for treatment as a principal element and considering the State and community acceptance.

The two capping alternatives which were evaluated are considered to be equal in terms of long-term effectiveness and permanence. The two leachate and ground water treatment options were considered equal in terms of reduction of toxicity, mobility or volume through treatment, although the wetlands treatment is an innovative technology and is less proven. The solid waste landfill cap was considered superior to the RCRA cap in terms of; 1) short-term effectiveness because it may be constructed more quickly; 2) implementability because it requires far less earth moving activities and does not require piping of Kings Run under the cap and; 3) the solid waste cap with the wetland treatment option is approximately $150,000,000 less costly than the RCRA cap with similar treatment.

Preference for Treatment as a Principal Element.

Threats from exposure to surface and ground water at this site shall be addressed through treatment in the constructed wetlands. The treatment system will remove contaminants of concern from collected waters and convert them into more stable forms. Because the on-site soils contain low levels of contamination over a large area, treatment is not a practicable solution for threats posed by them. For this reason, a containment option was selected over a treatment option.

XI. Additional Studies

Section 311 of CERCLA, 42 U.S.C. Section 9660, provides that U.S. EPA shall conduct "research evaluation, testing, development, and demonstration of alternative or innovative treatment technologies which may be utilized in response actions to achieve more permanent protection of human health and welfare and the environment.

Wetlands treatment of the collected leachate and ground water is an innovative technology which involves utilizing indigenous or introduced microflora to raise Ph of the waters and catalyze sulfate reducing reactions. The leachate has a high concentration of sulfate, therefore generation of sulfide in an anaerobic environment is assured. Under these conditions, iron sulfide precipitation should also remove arsenic as an arsenide. With the rise in pH to above 6, aluminum hydroxide will precipitate and this will also positively affect the removal of beryllium either as an hydroxide or an adsorbed species.

A bench-scale or screening-scale treatability study is currently in progress. Information gained from this study will be used to

Section 402 of the Clean Water Act (CWA) will be met by the wetlands treatment system. The discharge limits for treated ground water and landfill leachate discharged to Little McMahon Creek are listed in Attachment A. The limits may be modified to more stringent levels if proven feasible during the Remedial Design/Remedial Action process. Ohio Revised Code (ORC) 6111 establishes Ohio EPA's authority to set water quality standards (Section 6111.04) and regulate water pollution sources. The rules developed and implemented by Ohio EPA based on Chapter 6111 ORC are contained in OAC Section 3745-1-03 through 3745-1-07 inclusive, 3745-01-13, 3745-31-05, 3745-32-05, and 3745-33-05.

Soil

RCRA Land Disposal Restrictions (40 CFR Part 268)
The selected remedy involves capping wastes located on site, therefore off-site disposal will not occur as part of the selected remedy. Consequently, the RCRA LDRs will not be triggered.

Solid Waste Closure Requirements

ORC Chapter 3734 establishes Ohio EPA's authority to regulate closure of solid waste landfills. Pursuant to that statute, OAC 3745-27-11, 3745-27-10, and 3745-27-14 describe the specific requirements for final closure, ground water monitoring programs, and post-closure care of sanitary landfill facilities, respectively.

Cost-Effectiveness.

An analysis of cost effectiveness of the selected remedy indicates that the remedy chosen is cost effective. While the overall cost of the remedy is high, it is much less costly than and is as protective as a RCRA cap. The wetlands innovative treatment technology for collected leachate and ground water should provide effective treatment at lower capital and operation and maintenance costs, increasing the cost-effectiveness of the remedy.

Utilization of Permanent Solutions and Alternative Treatment (or resource recovery) Technologies to the Maximum Extent Practicable (MEP).

The U.S. EPA believes that the selected remedy represents the maximum extent which permanent solutions and treatment technologies can be utilized in a cost-effective manner for the final remedy at the Buckeye Reclamation Landfill site. Of the alternatives that are protective of human health and the environment and comply with ARARs, U.S. EPA has determined that the selected remedy provides the best balance of tradeoffs when considering long-term effectiveness and permanence, reduction in scope larger-scale, longer term studies to be conducted during the remedial design. If the wetlands do not prove effective in removing contaminants, chemical/physical treatment will be used.

Additional hydrogeologic studies will be performed during the remedial design of the selected remedy. The objective for these studies is to refine data on ground water flow directions in water bearing zones under the site, to better define locations of the water table, and to provide additional information on the extent of site related contamination. This information is required for proper design of the ground water and surface leachate seep collection system.

XII. Documentation of Significant Changes

The selected alternative is identical to the Preferred Alternative as described in the Proposed Plan. If the wetlands treatment system proves ineffective during the treatability studies in removing contaminants of concern, the Record of Decision will be modified with an Explanation of Significant Differences (ESD) to select chemical/physical treatment for the collected leachate and ground water.

Table 1. Average and Maximum Contaminant Concentrations at Buckeye Reclamation Landfill

GROUNDWATER
PRE-LANDFILL AVERAGE AND MAXIMUMS - (MG/L)
MW-2A, MW10

CHEMICAL	MW-2A AVERAGE	MW-2A MAXIMUM	MW-10 AVERAGE	MW-10 MAXIMUM	MW-2A AND MW-10 AVERAGE	MW-2A AND MW-10 MAXIMUM
ALUMINUM	2.22E+00	4.30E+00	8.22E-01	1.37E+00	1.52E+00	4.30E+00
ANTIMONY	2.66E-01	4.56E-01	1.80E-02	2.10E-02	1.42E-01	4.56E-01
ARSENIC	3.00E-02	5.00E-02	1.00E-02	1.00E-02	2.00E-02	5.00E-02
2-BUTANONE	1.00E-02	1.00E-02	1.00E-02	1.00E-02	1.00E-02	1.00E-02
BARIUM	3.40E-02	5.50E-02	6.80E-02	9.50E-02	5.10E-02	9.50E-02
BENZENE	5.00E-03	5.00E-03	5.00E-03	5.00E-03	5.00E-03	5.00E-03
BENZOIC ACID	5.00E-02	5.00E-02	5.00E-02	5.00E-02	5.00E-02	5.00E-02
BERYLLIUM	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03
CADMIUM	5.05E-04	5.10E-04	3.75E-04	5.00E-04	4.40E-04	5.10E-04
CALCIUM	4.34E+02	4.42E+02	5.16E+00	5.63E+00	2.20E+02	4.42E+02
CARBON DISULFIDE	5.00E-03	5.00E-03	5.00E-03	5.00E-03	5.00E-03	5.00E-03
CARBON TETRACHLORIDE	5.00E-03	5.00E-03	5.00E-03	5.00E-03	5.00E-03	5.00E-03
CHROMIUM	1.45E-02	2.40E-02	5.50E-03	6.00E-03	1.00E-02	2.40E-02
COBALT	5.50E-03	6.00E-03	5.00E-03	6.00E-03	5.25E-03	6.00E-03
COPPER	1.10E-02	1.80E-02	2.40E-02	4.40E-02	1.75E-02	4.40E-02
1,1-DICHLOROETHENE	5.00E-03	5.00E-03	5.00E-03	5.00E-03	5.00E-03	5.00E-03
DI-N-BUTYLPHTHALATE	1.00E-02	1.00E-02	6.00E-03	1.00E-02	8.00E-03	1.00E-02
ETHYLBENZENE	5.00E-03	5.00E-03	5.00E-03	5.00E-03	5.00E-03	5.00E-03
IRON	2.84E+02	2.96E+02	7.87E-01	8.77E-01	1.42E+02	2.96E+02
LEAD	1.00E-02	1.50E-02	1.50E-02	2.50E-02	1.25E-02	2.50E-02
MAGNESIUM	1.43E+02	1.45E+02	1.00E+00	1.00E+00	7.24E+01	1.45E+02
MANGANESE	3.67E+00	3.82E+00	2.00E-02	3.20E-02	1.05E+00	3.82E+00
NAPTHALENE	1.00E-02	1.00E-02	1.00E-02	1.00E-02	1.00E-02	1.00E-02
NICKEL	1.35E-02	1.00E-02	1.35E-02	1.00E-02	1.35E-02	1.00E-02
POTASSIUM	9.26E+00	9.40E+00	1.12E+00	1.75E+00	5.19E+00	9.40E+00
SODIUM	7.79E+02	8.36E+02	5.83E+02	6.45E+02	6.81E+02	8.36E+02
TOLUENE	5.00E-03	5.00E-03	5.00E-03	5.00E-03	5.00E-03	5.00E-03
TRANS-1,2-DICHLOROETHENE	5.00E-03	5.00E-03	5.00E-03	5.00E-03	5.00E-03	5.00E-03
1,1,1-TRICHLOROETHANE	5.00E-03	5.00E-03	5.00E-03	5.00E-03	5.00E-03	5.00E-03
TRICHLOROETHENE	5.00E-03	5.00E-03	5.00E-03	5.00E-03	5.00E-03	5.00E-03
VANADIUM	2.10E-02	2.50E-02	3.00E-03	3.00E-03	1.20E-02	2.50E-02
XYLENES (TOTAL)	5.00E-03	5.00E-03	5.00E-03	5.00E-03	5.00E-03	5.00E-03
ZINC	5.10E-02	9.20E-02	3.53E-02	5.30E-02	4.32E-02	9.20E-02

Table 1. (Continued)

GROUNDWATER
GOB AQUIFER
AVERAGES AND MAXIMUMS (MG/L)

	BUCKEYE LANDFILL		PRE-LANDFILL	
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
ALUMINUM	2.07E+00	8.10E+00	2.22E+00	4.30E+00
ANTIMONY	3.20E-01	1.44E+00	2.44E-01	4.54E-01
ARSENIC	5.65E-02	1.42E-01	3.00E-02	5.00E-02
BARIUM	1.73E-01	5.70E-01	3.40E-02	5.50E-02
BENZENE	5.12E-03	9.00E-03	5.00E-03	5.00E-03
BENZOIC ACID	4.56E-02	5.10E-02	5.00E-02	5.00E-02
BERYLLIUM	1.14E-03	1.60E-03	1.00E-03	1.00E-03
CADMIUM	7.13E-06	2.00E-05	5.05E-06	5.10E-06
CALCIUM	3.97E+02	4.05E+02	4.34E+02	4.42E+02
CARBON DISULFIDE	4.62E-03	5.00E-03	5.00E-03	5.00E-03
CARBON TETRACHLORIDE	4.62E-03	5.00E-03	5.00E-03	5.00E-03
CHROMIUM	1.69E-02	5.00E-02	1.45E-02	2.40E-02
COBALT	7.90E-03	1.70E-02	5.50E-03	6.00E-03
COPPER	1.44E-02	3.00E-02	1.10E-02	1.00E-02
1,1-DICHLOROETHENE	4.62E-03	5.00E-03	5.00E-03	5.00E-03
DI-N-BUTYLPHTHALATE	7.13E-03	1.00E-02	1.00E-02	1.00E-02
ETHYLBENZENE	4.00E-03	5.00E-03	5.00E-03	5.00E-03
IRON	2.51E+02	8.60E+02	2.04E+02	2.94E+02
LEAD	1.00E-02	2.50E-02	1.00E-02	1.50E-02
MAGNESIUM	8.75E+01	1.44E+02	1.43E+02	1.45E+02
MANGANESE	2.64E+00	5.17E+00	3.67E+00	3.82E+00
NAPHTHALENE	8.63E-03	1.00E-02	1.00E-02	1.00E-02
NICKEL	2.04E-02	3.20E-02	1.35E-02	1.00E-02
POTASSIUM	9.05E+01	3.14E+02	9.26E+00	9.40E+00
SODIUM	7.33E+02	2.32E+03	7.79E+02	8.34E+02
TRANS-1,2-DICHLOROETHENE	4.62E-03	5.00E-03	5.00E-03	5.00E-03
1,1,1-TRICHLOROETHANE	4.75E-03	5.00E-03	5.00E-03	5.00E-03
TRICHLOROETHENE	4.75E-03	5.00E-03	5.00E-03	5.00E-03
VANADIUM	1.07E-02	7.50E-02	2.10E-02	2.50E-02
XYLENES (TOTAL)	6.63E-03	1.00E-02	5.00E-03	5.00E-03
ZINC	1.21E-01	5.00E-01	5.10E-02	9.20E-02

GROUNDWATER
BEDROCK AQUIFER
AVERAGES AND MAXIMUMS (MG/L)

	BUCKEYE LANDFILL		PRE LANDFILL	
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
ALUMINUM	5.66E-01	1.29E+00	[illegible]	1.37E+00
ANTIMONY	2.79E-02	6.10E-02	1.50E-02	2.10E-02
ARSENIC	1.00E-02	1.00E-02	1.00E-02	1.00E-02
2-BUTANONE	1.10E-02	2.40E-02	1.00E-02	1.00E-02
BARIUM	1.03E-01	3.06E-01	6.00E-02	9.50E-02
BENZENE	5.62E-03	1.00E-02	5.00E-03	5.00E-03
BIS(2-ETHYLHEXYL)PHTHALATE	2.02E-01	2.02E-01		
CADMIUM	1.03E-03	3.20E-03	3.75E-04	5.00E-04
CALCIUM	3.46E+02	5.50E+02	5.16E+00	5.63E+00
CHROMIUM	8.25E-03	2.00E-02	5.50E-03	6.00E-03
COBALT	1.03E-02	2.80E-02	5.00E-03	6.00E-03
COPPER	7.35E-03	1.90E-02	2.40E-02	4.40E-02
DI-N-BUTYLPHTHALATE	8.50E-03	1.00E-02	6.00E-03	1.00E-02
IRON	7.90E+00	1.64E+01	7.86E-01	8.77E-01
MAGNESIUM	1.02E+02	1.31E+02	1.79E+00	1.80E+00
MANGANESE	5.60E-01	1.10E+00	2.80E-02	3.20E-02
NICKEL	2.37E-02	5.30E-02	1.35E-02	1.80E-02
POTASSIUM	1.57E+01	4.67E+01	1.12E+00	1.75E+00
SODIUM	1.55E+02	2.59E+02	5.03E+02	6.45E+02
VANADIUM	5.23E-03	1.50E-02	3.00E-03	3.00E-03
ZINC	1.63E-02	3.90E-02	3.55E-02	5.30E-02

Table 1. (Continued)

GROUNDWATER
REDSTONE LIMESTONE AQUIFER
AVERAGES AND MAXIMUMS (MG/L)

	BUCKEYE LANDFILL AVERAGE	BUCKEYE LANDFILL MAXIMUM	PRE-LANDFILL AVERAGE	PRE-LANDFILL MAXIMUM
ALUMINUM	1.54E+01	5.90E+01	2.22E+00	4.30E+00
ANTIMONY	6.75E-02	2.19E-01	2.66E-01	4.56E-01
ARSENIC	2.03E-01	4.70E-01	3.00E-02	5.00E-02
BARIUM	5.15E-01	1.53E+00	3.40E-02	5.50E-02
BENZENE	9.00E-03	1.50E-02	5.00E-03	5.00E-03
BERYLLIUM	3.25E-03	1.00E-02	1.00E-03	1.00E-03
CADMIUM	3.62E-03	7.90E-03	5.05E-04	5.10E-04
CALCIUM	1.67E+02	2.31E+02	4.34E+02	4.42E+02
CHROMIUM	3.74E-02	1.10E-01	1.45E-02	2.40E-02
COBALT	3.10E-02	1.13E-01	5.50E-03	6.00E-03
COPPER	1.31E-01	4.56E-01	1.10E-02	1.80E-02
DI-N-BUTYLPHTHALATE	9.00E-03	1.50E-02	1.00E-02	1.00E-02
1,2-DICHLOROBENZENE	2.25E-02	4.00E-02	1.00E-02	1.00E-02
IRON	3.12E+01	1.70E+02	2.84E+02	2.96E+02
LEAD	9.25E-02	1.90E-01	1.00E-02	1.50E-02
MAGNESIUM	6.50E+01	1.21E+02	1.43E+02	1.45E+02
MANGANESE	2.52E-01	7.36E-01	3.67E+00	3.82E+00
MERCURY	2.53E-04	4.10E-04	2.00E-04	2.00E-04
NICKEL	1.21E-01	4.25E-01	1.35E-02	1.80E-02
POTASSIUM	4.02E+01	8.64E+01	9.26E+00	9.40E+00
SELENIUM	4.40E-02	5.00E-02	3.50E-02	5.00E-02
SODIUM	1.42E+03	2.24E+03	7.79E+02	8.36E+02
TOLUENE	6.50E-03	1.20E-02	5.00E-03	5.00E-03
VANADIUM	3.30E-02	1.15E-01	2.10E-02	2.50E-02
ZINC	2.62E-01	8.27E-01	5.10E-02	9.20E-02

GROUNDWATER
UNIONTOWN SANDSTONE AQUIFER
AVERAGES AND MAXIMUMS (MG/L)

	BUCKEYE LANDFILL AVERAGE	BUCKEYE LANDFILL MAXIMUM	PRE-LANDFILL AVERAGE	PRE-LANDFILL MAXIMUM
ALUMINUM	3.23E+00	9.60E+00	2.22E+00	4.30E+00
ANTIMONY	2.27E-02	4.70E-02	2.66E-01	4.56E-01
BARIUM	7.80E-02	1.67E-01	3.40E-02	5.50E-02
BENZENE	8.07E-03	3.20E-02	5.00E-03	5.00E-03
BIS(2-ETHYLHEXYL)PHTHALATE				
CADMIUM	1.43E-03	4.80E-03	5.05E-04	5.10E-04
CALCIUM	3.04E+02	5.51E+02	4.34E+02	4.42E+02
CARBON DISULFIDE	4.75E-03	5.00E-03	5.00E-03	5.00E-03
CARBON TETRACHLORIDE	4.75E-03	5.00E-03	5.00E-03	5.00E-03
CHROMIUM	1.05E-02	1.80E-02	1.45E-02	2.40E-02
COBALT	1.26E-02	2.60E-02	5.50E-03	6.00E-03
COPPER	2.13E-02	7.40E-02	1.10E-02	1.80E-02
DI-N-BUTYLPHTHALATE	7.50E-03	1.00E-02	1.00E-02	1.00E-02
IRON	8.11E+00	1.63E+01	2.84E+02	2.96E+02
LEAD	8.65E-03	1.90E-02	1.00E-02	1.50E-02
MAGNESIUM	7.90E+01	1.30E+02	1.43E+02	1.45E+02
MANGANESE	4.73E+00	9.33E+00	3.67E+00	3.82E+00
NICKEL	2.04E-02	2.70E-02	1.35E-02	1.80E-02
POTASSIUM	4.77E+00	6.19E+00	9.26E+00	9.40E+00
SODIUM	2.66E+02	6.62E+02	7.79E+02	8.36E+02
1,1,1-TRICHLOROETHANE	4.62E-03	5.00E-03	5.00E-03	5.00E-03
TOLUENE	4.75E-03	5.00E-03	5.00E-03	5.00E-03
TRICHLOROETHENE	4.62E-03	5.00E-03	5.00E-03	5.00E-03
VANADIUM	7.13E-03	1.40E-02	2.10E-02	2.50E-02
ZINC	4.10E-02	1.20E-01	5.10E-02	9.20E-02

Table 1. (Continued)

GROUNDWATER
WAYNESBURG COAL AQUIFER
AVERAGES AND MAXIMUMS

	BUCKEYE LANDFILL		PRE-LANDFILL	
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
ALUMINUM	1.97E+00	6.74E+00	2.22E+00	4.30E+00
ANTIMONY	2.23E-02	4.10E-02	2.66E-01	4.54E-01
ARSENIC	2.43E-02	7.00E-02	3.00E-02	5.00E-02
BARIUM	1.54E-01	2.00E-01	3.40E-02	5.50E-02
BENZENE	8.17E-03	2.00E-02	5.00E-03	5.00E-03
BERYLLIUM	1.00E-03	1.00E-03	1.00E-03	1.00E-03
BIS(2-ETHYLHEXYL)PHTHALATE				
CADMIUM	6.00E-04	1.10E-03	5.05E-04	5.10E-04
CALCIUM	1.32E+02	3.96E+02	4.34E+02	4.42E+02
CHROMIUM	6.90E-03	1.20E-02	1.45E-02	2.40E-02
COPPER	2.04E-02	9.10E-02	1.10E-02	1.00E-02
1,1-DICHLOROETHANE	5.83E-03	1.00E-02	5.00E-03	5.00E-03
ETHYLBENZENE	1.00E-02	8.00E-02	5.00E-03	5.00E-03
IRON	9.11E+00	2.35E+01	2.84E+02	2.94E+02
LEAD	6.43E-03	1.30E-02	1.00E-02	1.50E-02
MAGNESIUM	5.84E+01	1.95E+02	1.43E+02	1.45E+02
MANGANESE	8.69E-01	3.45E+00	3.67E+00	3.82E+00
NICKEL	2.20E-02	5.40E-02	1.35E-02	1.80E-02
POTASSIUM	9.19E+00	2.69E+01	9.26E+00	9.40E+00
SODIUM	3.16E+02	3.94E+02	7.79E+02	8.36E+02
XYLENES (TOTAL)	9.03E-03	3.60E-02	5.00E-03	5.00E-03
VANADIUM	3.33E-03	1.40E-02	2.10E-02	2.50E-02
ZINC	4.60E-02	1.01E-01	5.10E-02	9.20E-02

GROUNDWATER
UPGLE LIMESTONE
AVERAGES AND MAXIMUMS

	BUCKEYE LANDFILL		PRE-LANDFILL	
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
ALUMINUM	5.76E+00	2.72E+01	2.22E+00	4.30E+00
ANTIMONY	3.44E-02	6.00E-02	2.66E-01	4.54E-01
ARSENIC	1.06E-02	1.30E-02	3.03E-02	5.00E-02
BARIUM	8.90E-02	3.00E-01	3.40E-02	5.50E-02
BERYLLIUM	1.04E-03	1.20E-03	1.03E-03	1.00E-03
CADMIUM	1.54E-03	4.40E-03	5.05E-04	5.10E-04
CALCIUM	3.26E+02	5.72E+02	4.34E+02	4.42E+02
CHROMIUM	1.08E-02	3.10E-02	1.45E-02	2.40E-02
COBALT	1.26E-02	3.30E-02	5.50E-03	6.00E-03
COPPER	1.61E-02	4.60E-02	1.10E-02	1.80E-02
DI-N-BUTYLPHTHALATE	6.80E-03	1.00E-02	1.00E-02	1.00E-02
IRON	1.10E+01	4.00E+01	2.84E+02	2.94E+02
LEAD	8.84E-03	2.60E-02	1.00E-02	1.50E-02
MAGNESIUM	2.00E+02	4.71E+02	1.43E+02	1.45E+02
MANGANESE	4.21E+00	1.14E+01	3.67E+00	3.82E+00
NICKEL	2.74E-02	6.70E-02	1.35E-02	1.80E-02
POTASSIUM	1.00E+01	1.81E+01	9.26E+00	9.40E+00
SODIUM	4.67E+02	8.29E+02	7.79E+02	8.36E+02
VANADIUM	1.03E-02	3.60E-02	2.10E-02	2.50E-02
ZINC	2.71E-02	8.40E-02	5.10E-02	9.20E-02

Table 1. (Continued)

GROUNDWATER
RESIDENTIAL WELLS
AVERAGES AND MAXIMUMS

	BUCKEYE LANDFILL AVERAGE	BUCKEYE LANDFILL MAXIMUM	PRE-LANDFILL AVERAGE	PRE-LANDFILL MAXIMUM
ALUMINUM	3.67E-01	1.22E+00	4.90E-02	4.90E-02
BARIUM	6.58E-02	1.00E-01	1.26E-01	1.26E-01
CADMIUM	5.10E-04	6.10E-04	5.00E-04	5.00E-04
CALCIUM	1.37E+02	3.24E+02	1.43E+02	1.43E+02
COPPER	1.52E-02	3.70E-02	1.20E-02	1.20E-02
IRON	4.63E+00	1.51E+01	2.70E-01	2.70E-01
LEAD	1.07E-02	3.00E-02	5.00E-03	5.00E-03
MAGNESIUM	2.96E+01	5.05E+01	5.00E+00	5.00E+00
MANGANESE	2.99E-02	1.26E-01	4.40E-03	4.40E-03
NICKEL	9.17E-03	1.00E-02	9.00E-03	9.00E-03
POTASSIUM	3.45E+00	1.29E+01	2.32E+00	2.32E+00
SODIUM	6.77E+01	1.45E+02	3.94E+01	3.94E+01
TOLUENE	4.35E-04	5.00E-04	5.00E-04	5.00E-04
TRICHLOROFLUOROMETHANE	4.50E-04	5.00E-04	5.00E-04	5.00E-04
ZINC	1.10E-01	2.26E-01	1.76E-01	1.76E-01

LEACHATE AVERAGES
BUCKEYE LANDFILL = STATIONS 1,2,3,4
PRE-LANDFILL = STATIONS 5,6

	BUCKEYE LANDFILL (mg/L) AVERAGE	BUCKEYE LANDFILL (mg/L) MAXIMUM	PRE-LANDFILL (mg/L) AVERAGE	PRE-LANDFILL (mg/L) MAXIMUM
ACETONE	3.14E-02	1.10E-01	1.05E-02	1.20E-02
ALUMINUM	2.37E+01	8.49E+01	3.77E+02	5.57E+02
ANTIMONY	1.94E-01	8.30E-01	2.44E-01	5.64E-01
ARSENIC	1.23E-02	2.00E-02	1.19E-01	2.63E-01
2-BUTANONE	4.16E-01	4.20E+00	1.00E-02	1.00E-02
BARIUM	1.09E-01	4.05E-01	7.30E-03	1.00E-02
BERYLLIUM	5.05E-03	1.50E-02	2.26E-02	2.90E-02
CADMIUM	8.60E-04	2.80E-03	1.11E-02	1.40E-02
CALCIUM	4.15E+02	7.85E+02	4.00E+02	4.65E+02
CHROMIUM	1.93E-02	4.00E-02	1.58E-01	2.47E-01
COBALT	3.54E-02	8.00E-02	4.18E-01	4.79E-01
MERCURY	2.00E-04	2.00E-04	2.00E-04	2.00E-04
COPPER	2.71E-02	1.00E-01	1.16E-01	2.48E-01
ETHYLBENZENE	5.64E-02	5.00E-01	5.00E-03	5.00E-03
2-HEXANONE	1.14E-01	1.00E+00	1.00E-02	1.00E-02
IRON	3.10E+02	9.27E+02	6.36E+02	8.29E+02
LEAD	9.21E-03	2.20E-02	5.00E-03	5.00E-03
4-METHYL-2-PENTANONE	1.13E-01	1.00E+00	1.00E-02	1.00E-02
4-METHYLPHENOL	6.01E-01	3.00E+00	1.67E-02	5.00E-02
MAGNESIUM	9.44E+01	1.22E+02	5.15E+01	6.52E+01
MANGANESE	6.48E+00	2.00E+01	4.64E+00	5.82E+00
NICKEL	1.20E-01	3.02E-01	1.02E+00	1.21E+00
PHENOL	1.66E-01	8.20E-01	1.67E-02	5.00E-02
POTASSIUM	6.72E+01	1.91E+02	6.20E+00	1.13E+01
SELENIUM	1.66E-02	5.00E-02	3.50E-02	5.00E-02
SODIUM	2.09E+02	4.27E+02	2.50E+01	2.70E+01
TOLUENE	5.92E-02	5.00E-01	5.00E-03	5.00E-03
VANADIUM	2.95E-02	1.00E-01	1.01E-01	2.14E-01
XYLENES	5.60E-02	5.00E-01	5.00E-03	5.00E-03
ZINC	3.70E-01	1.17E+00	1.05E+00	2.10E+00

Table 1. (Continued)

SURFACEWATER AVERAGE AND MAXIMUM VALUES
BUCKEYE LANDFILL STATIONS = BY-1, BY-2, BY-3, BY-4, BY-10 (KINGS RUN)
PRE-LANDFILL = BY-6, BY-11
(MG/L)

	BUCKEYE LANDFILL		PRE-LANDFILL	
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
ALUMINUM	4.47E+01	1.90E+02	8.09E+01	1.92E+02
ANTIMONY	4.46E-02	2.25E-01	3.05E-02	1.10E-01
ARSENIC	2.55E-02	9.20E-02	1.33E-02	5.00E-02
BARIUM	2.00E-01	1.22E+00	4.90E-02	7.70E-02
BERYLLIUM	3.70E-03	1.10E-02	5.45E-03	1.10E-02
CADMIUM	2.03E-03	9.20E-03	2.33E-03	5.20E-03
CALCIUM	2.02E+02	3.30E+02	1.90E+02	2.90E+02
CHROMIUM	4.49E-02	2.10E-01	2.20E-02	4.00E-02
COBALT	5.01E-02	1.95E-01	9.03E-02	1.91E-01
MERCURY	5.59E-04	2.20E-03	2.00E-04	2.00E-04
COPPER	8.01E-02	4.50E-01	1.07E-02	5.30E-02
DI-N-BUTYLPHTHALATE	1.00E-02	1.40E-02	9.90E-03	1.10E-02
DIETHYLPHTHALATE	1.10E-02	3.40E-02	1.00E-02	1.10E-02
2-HEXANONE	1.03E-02	1.30E-02	1.00E-02	1.00E-02
IRON	1.62E+02	5.29E+02	7.82E+01	1.01E+02
LEAD	3.42E-02	1.10E-01	6.67E-03	1.50E-02
MAGNESIUM	4.17E+01	8.22E+01	5.06E+01	7.72E+01
MANGANESE	2.03E+00	5.01E+00	1.04E+00	2.12E+00
NICKEL	1.31E-01	4.54E-01	2.24E-01	4.79E-01
POTASSIUM	1.30E+01	4.47E+01	2.95E+00	3.92E+00
SILVER	6.50E-03	3.00E-02	7.50E-03	3.00E-02
SODIUM	6.30E+01	1.33E+02	8.22E+01	1.04E+02
VANADIUM	4.90E-02	2.27E-01	6.33E-03	1.30E-02
ZINC	2.95E-01	1.08E+00	5.00E-01	1.14E+00

SEDIMENTS
BUCKEYE LANDFILL = SED-1, SED-2, SED-3, SED-4, SED-7
PRE-LANDFILL = SED-6, SED-11

	BUCKEYE LANDFILL		PRE-LANDFILL	
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
ACETONE	1.60E-02	3.20E-02	2.55E 02	3.60E-02
ALUMINUM	8.26E+03	1.25E+04	7.91E+03	1.06E+04
ANTHRACENE	7.12E-01	1.40E+00	4.35E-01	6.20E-01
ANTIMONY	2.90E+01	4.20E+01	2.15E+01	2.50E+01
ARSENIC	1.36E+01	1.80E+01	7.65E+00	9.00E+00
BARIUM	8.70E+01	1.30E+02	9.80E+01	1.75E+02
BENZO(A)ANTHRACENE	7.12E-01	1.40E+00	7.40E-01	8.60E-01
BENZO(A)PYRENE	7.12E-01	1.40E+00	7.00E-01	7.80E-01
BENZO(B)FLUORANTHENE	7.12E-01	1.40E+00	6.45E-01	6.70E-01
BENZO(G,H,I)PERYLENE	7.12E-01	1.40E+00	5.75E-01	6.20E-01
BENZO(K)FLUORANTHENE	7.12E-01	1.40E+00	7.40E-01	8.60E-01
BERYLLIUM	7.52E-01	9.00E-01	6.05E-01	9.20E-01
BIS(2-ETHYLHEXYL)PHTHALATE	3.96E-01	5.40E-01	6.50E-01	6.80E-01
BUTYLBENZYLPHTHALATE	7.12E-01	1.40E+00	3.60E-01	6.20E-01
CALCIUM	6.49E+03	1.70E+04	4.93E+03	9.19E+03
CHROMIUM	1.16E+01	2.00E+01	1.10E+01	1.50E+01
CHRYSENE	6.12E-01	1.40E+00	7.65E-01	9.10E-01
COBALT	7.70E+00	1.30E+01	7.95E+00	1.40E+01
COPPER	3.09E+01	5.50E+01	1.95E+01	2.60E+01
DIBENZOFURAN	5.92E-01	1.40E+00	4.50E-01	6.80E-01
DIBENZ(A,H)ANTHRACENE	7.12E-01	1.40E+00	6.50E-01	6.80E-01
DI-N-BUTYLPHTHALATE	4.22E-01	6.20E-01	6.50E-01	6.80E-01
FLUORANTHENE	6.20E-01	1.40E+00	1.16E+00	1.70E+00
FLUORENE	7.12E-01	1.40E+00	3.65E-01	6.20E-01
IDENO(1,2,3-CD)PYRENE	7.12E-01	1.40E+00	5.95E-01	6.20E-01
IRON	2.53E+04	3.36E+04	2.29E+04	2.66E+04
LEAD	1.42E+01	1.90E+01	1.96E+01	3.25E+01
2-METHYLNAPHTHALENE	4.06E-01	7.40E-01	4.65E-01	6.80E-01
MAGNESIUM	2.50E+03	6.10E+03	1.69E+03	3.17E+03
MANGANESE	1.94E+02	4.50E+02	2.92E+02	5.76E+02
METHYLENE CHLORIDE	8.00E-03	1.00E-02	7.50E-03	8.00E-03
NAPHTHALENE	5.50E-01	1.40E+00	4.35E-01	6.80E-01
NICKEL	1.86E+01	2.60E+01	1.30E+01	2.40E+01
PHENANTHRENE	4.90E-01	1.10E+00	6.30E-01	9.10E-01
POTASSSIUM	1.49E+03	2.63E+03	1.42E+03	1.47E+03
PYRENE	7.12E-01	1.40E+00	1.01E+00	1.40E+00
SELENIUM	1.70E+00	2.20E+00	1.50E+00	1.60E+00
SODIUM	3.15E+02	5.07E+02	3.86E+02	4.23E+02
TOLUENE	8.60E-03	1.00E-02	4.50E-03	8.00E-03
VANADIUM	1.37E+01	2.40E+01	1.35E+01	1.60E+01
ZINC	6.00E+01	1.00E+02	4.81E+01	8.70E+01

Table 1. (Continued)

SURFICIAL SOILS
AVERAGES AND MAXIMUMS (MG/L)

CHEMICAL	BUCKEYE LANDFILL AVERAGE	BUCKEYE LANDFILL MAXIMUM	PRE-LANDFILL AVERAGE	PRE-LANDFILL MAXIMUM
ACETONE	5.61E-02	2.30E-01	2.04E-02	5.50E-02
ALUMINUM	9.13E+03	1.10E+04	7.91E+03	2.14E+04
ANTIMONY	1.01E+01	1.70E+01	8.14E+00	1.80E+01
ARSENIC	2.21E+01	7.50E+01	1.21E+01	1.50E+01
2-BUTANONE				
BARIUM	1.95E+02	7.82E+02	5.54E+01	1.25E+02
BENZO(A)ANTHRACENE	5.00E-01	5.40E-01	5.00E-01	5.90E-01
BERYLLIUM	9.99E-01	1.60E+00	6.19E-01	1.60E+00
BIS(2-ETHYLHEXYL)PHTHALATE				
CADMIUM	5.24E-01	1.20E+00	1.66E-01	3.40E-01
CALCIUM	1.59E+04	3.95E+04	2.62E+03	4.80E+03
CHROMIUM	1.88E+01	3.70E+01	1.33E+01	2.90E+01
CHRYSENE	4.57E-01	5.20E-01	7.49E-01	4.00E+00
COBALT	1.15E+01	1.70E+01	9.20E+00	2.00E+01
COPPER	2.49E+01	4.00E+01	1.96E+01	4.10E+01
2,4-DIMETHYL PHENOL	5.00E-01	5.40E-01	1.21E+00	2.70E+00
DIBENZOFURAN	5.22E+01	3.10E+02	3.26E+00	7.20E+00
DIMETHYL PHTHALATE	4.40E-01	5.40E-01	4.80E-01	5.00E-01
FLUORANTHENE	4.84E-01	5.40E-01	6.85E-01	1.30E+00
IRON	2.75E+04	4.65E+04	1.94E+04	2.80E+04
LEAD	3.40E+01	1.00E+02	3.47E+01	9.40E+01
2-METHYLNAPHTHALENE	7.42E+01	4.40E+02	5.75E+00	1.29E+01
2-METHYLPHENOL	5.73E-01	1.40E+00	1.67E+00	5.60E+00
4-METHYLPHENOL	7.77E-01	2.30E+00	4.93E+00	1.40E+01
MAGNESIUM	2.30E+03	8.16E+03	5.95E+02	2.34E+03
MANGANESE	2.84E+02	8.46E+02	8.75E+01	3.84E+02
MERCURY	1.40E-01	2.40E-01	1.78E-01	2.60E-01
NAPHTHALENE	5.54E+01	3.30E+02	4.49E+00	1.07E+01
NICKEL	2.10E+01	2.80E+01	1.49E+01	3.30E+01
PHENANTHRENE	1.48E+02	8.00E+02	4.60E+00	1.40E+01
PHENOL	6.07E-01	1.40E+00	3.05E+00	9.60E+00
POTASSIUM	1.83E+03	2.80E+03	1.05E+03	4.40E+03
PYRENE	3.54E+01	2.10E+02	6.05E-01	1.30E+00
SELENIUM	2.33E+00	3.60E+00	2.20E+00	4.00E+00
SILVER	1.33E+00	1.60E+00	1.50E+00	1.70E+00
SODIUM	4.71E+02	1.04E+03	5.50E+02	1.20E+03
THALLIUM	2.40E+00	2.80E+00	2.55E+00	3.20E+00
TOLUENE				
VANADIUM	1.74E+01	2.70E+01	1.80E+01	3.90E+01
ZINC	6.50E+02	6.54E+03	2.40E+01	6.70E+01

Table 2.
Toxicity Factors for Quantification of Chronic and Lifetime Hazards for Indicator Chemicals at the BRL Site[1]

Chemical	Chronic Noncarcinogen RfDs: Oral RfD (mg/kg/day)	Chronic Noncarcinogen RfDs: Inhalation RfD (mg/kg/day)	Carcinogen Slope Factors: Cancer Slope Factor (Oral) (mg/kg/day)-1	Carcinogen Slope Factors: Cancer Slope Factor (Inhalation) (mg/kg/day)-1	Cancer Weight of Evidence
Arsenic	1.00E-03[2]	NA	1.75E+00[2]	5.00E+01	A
Benzene	NA	NA	2.90E-02	2.90E-02	A
Beryllium	5.00E-03	NA	4.30E+00	8.40E+00	B2
Cadmium	5.00E-04	NA	NA	6.10E+00	B1
Carbon Tetrachloride	7.00E-04	NA	1.30E-01	1.30E-01	B2
Chromium[3]	5.00E-03	NA	NA	4.10E+01	A
1.1-dichloroethene	9.00E-03	NA	6.00E-01	1.16E+00	C
Lead	NA	NA	NA	NA	B2
Nickel	2.00E-02	NA	NA	NA	NA
Carcinogenic PAHs[4]	NA	NA	1.15E+01	6.10E+00[5]	B2
Toluene	3.00E-01	5.70E-01[6]	NA	NA	D
Trichloroethene[7]	NA	NA	1.10E-02	1.70E-02	B2

[1] Source: IRIS, June 5, 1990 (unless otherwise indicated).

[2] Oral RfD and cancer slope factors for arsenic concurrently under review by U.S. EPA. The oral values herein reported are derived from a recent U.S. EPA forum report on arsenic (U.S. EPA, 1988).

[3] The RfD and Cancer Slope Factor for chromium reflects the most conservative value provided for either chromium (III) or chromium (VI): Noncarcinogen Oral Rfd - chromium (VI); Inhalation Cancer Slope Factor - chromium (VI)

[4] Toxicity factors for PAHs are based on values for benzo(a)pyrene.

[5] Source for CSF values for carcinogenic PAHs: ECAO, 1984.

[6] Source for toluene RfD values: U.S. EPA, 1989b. Value derived assuming 70 kg body weight and 20 m3/day inhalation rate.

[7] Source for trichloroethene CSF values: U.S. EPA, 1989b.

Table 2. (Continued)
Toxicity Factors for Quantification of Subchronic Hazards for Indicator Chemicals at the BRL Site[1]

Chemical	Subchronic RfDs for Noncarcinogens Oral RfD (mg/kg/day)	Inhalation RfD (mg/kg/day)
Arsenic	1.00E-03	ND
Benzene	ND	ND
Beryllium	5.00E-03	ND
Cadmium	ND	ND[2]
Carbon Tetrachloride	7.00E-03	ND
Chromium[3]	2.00E-02	ND
1,1-dichloroethene	9.00E-03	ND
Lead	ND	ND[4]
Nickel	2.00E-02	ND
Carcinogenic PAHs[5]	ND	ND
Toluene	4.00E-01	5.70E-01[6]
Trichloroethene	ND	ND

(1) Source: U.S. EPA 1989b.
(2) Because of background dietary exposure:, an RfD was not estimated.
(3) The RfD for chromium reflects the most conservative value provided for either chromium (III) or chromium (VI): Noncarcinogen Oral Rfd - chromium (VI)
(4) Final draft air quality criteria document (600/8-83-028F) declines to derive an air quality criterion for lead.
(5) Toxicity factors for PAHs are based on values for benzo(a)pyrene.
(6) Value derived assuming 70 kg body weight and 20 m3/day Inhalation rate.

Table 3.
Adjusted Oral Toxicity Values for Quantification of Subchronic, Chronic, and Lifetime Dermal Hazards and Risks Associated with Indicator Chemicals at the BRL Site[1]

Chemical	Absorption Factors Used for Oral Toxicity Values[2]	Subchronic Noncancer Values: Subchronic Oral RfD (mg/kg/day)	Subchronic Noncancer Values: Adjusted[2] Subchronic RfD (mg/kg/day)	Chronic Noncancer Values: Chronic Oral RfD (mg/kg/day)	Chronic Noncancer Values: Adjusted[3] Chronic RfD (mg/kg/day)	Carcinogen Values: Cancer Slope Factor (Oral) (mg/kg/day)-1	Carcinogen Values: Adjusted[4] Slope (mg/kg/day)-1
Arsenic	95.00	1.00E-03	9.50E-04	1.00E-03	9.50E-04	1.75E+00	1.84E+00
Benzene	90.00	NA	NA	NA	NA	2.90E-02	3.22E-02
Beryllium	10.00	5.00E-03	5.00E-04	5.00E-03	5.00E-04	4.30E+00	4.30E+01
Cadmium	7.00	NA	NA	5.00E-04	3.50E-05	NA	NA
Carbon Tetrachloride	86.00	7.00E-03	6.02E-03	7.00E-04	6.02E-04	1.30E-01	1.51E-01
Chromium[5]	50.00	2.00E-02	1.00E-02	5.00E-03	2.50E-03	NA	NA
1,1-dichloroethene	100.00	9.00E-03	9.00E-03	9.00E-03	9.00E-03	6.00E-01	6.00E-01
Lead	50.00	NA	NA	NA	NA	NA	NA
Nickel	10.00	2.00E-02	2.00E-03	2.00E-02	2.00E-03	NA	NA
Carcinogenic PAHs[4]	60.00	NA	NA	NA	NA	1.15E+01	ND[7]
Toluene	100.00	4.00E-01	4.00E-01	3.00E-01	3.00E-01	NA	NA
Trichloroethene[7]	100.00	NA	NA	NA	NA	1.10E-02	1.10E-02

(1) Sources for subchronic and chronic RfD/CSF values = U.S. EPA, 1990; U.S. EPA, 1988; ECAO, 1984; U.S. EPA, 1989b.

(2) Oral absorption factors are discussed in Appendix D (Source U.S. EPA, 1990).

(3) Adjustment of an administered to an absorbed dose RfD:
(Administered RfD) x (Oral Absorption Factor) = Absorbed Dose RfD

(4) Adjustment of an administered to an absorbed dose slope factor:
(Administered Slope Factor)-1/(Oral Absorption Factor)

(5) The RfD and Cancer Slope Factor for chromium reflects the most conservative value provided for either chromium (III) or chromium (VI): Noncarcinogen Oral RfD - chromium (VI)

(6) Toxicity factors for PAHs are based on values for benzo(a)pyrene.

(7) Because PAHs such as benzo(a)pyrene are skin carcinogens which act directly at the point of contact, it is inappropriate to use the oral slope factor to evaluate dermal cancer risks for these compounds.

Table 4. Summary of Noncancer Hazard/Cancer Risk Calculations for Environmental Media at the BRL Site for Existing On-site Exposure Pathways: Dirt Bike/Trespasser Exposure Scenarios

Appendix C Table	Environmental Media	Exposure Route	Total Pathway Noncancer Hazard Index* Pre-Landfill AVG	Pre-Landfill MAX	BRL Site AVG	BRL Site MAX	Total Pathway Cancer Risk** Pre-Landfill AVG	Pre-Landfill MAX	BRL Site AVG	BRL Site MAX
Table C-1	Soils	Ingestion	3.18E-03	5.59E-03	6.71E-03	2.06E-02	6.20E-07	1.23E-06	7.54E-07	2.16E-06
Table C-2	Soils	Inhalation					2.30E-04	3.90E-04	3.73E-04	1.04E-03
Table C-3	Leachate	Dermal	2.96E-03	5.25E-03	4.89E-04	2.09E-03	2.31E-07	4.42E-07	3.26E-08	7.51E-08
Table C-4	Surfacewater	Dermal	4.46E-04	1.24E-03	5.89E-04	2.30E-03	3.53E-08	1.02E-07	4.57E-08	1.57E-07
Table C-5	Soils	Dermal	3.80E-03	5.57E-03	6.69E-03	2.06E-02	3.19E-06	8.16E-06	2.13E-06	4.17E-06
Site Total for Existing Exposures			1.04E-02	1.76E-02	1.45E-02	4.56E-02	2.34E-04	4.00E-04	3.76E-04	1.05E-03

*Hazard indices >1.0 indicate that the potential exists for non-carcinogenic effects from exposure to chemical concentrations detected at the BRL site.

**Cancer risks >1.0E-06 indicate that the potential exists for carcinogenic effects from exposure to chemical concentrations detected at the BRL site.

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Table 4. Summary of Noncancer Hazard/Cancer Risk Calculations for Environmental Media at the BRL Site for Potential On-Site Pathways: Residential Living On-Site in a Future Development

Appendix C Table	Environmental Media	Exposure Route	Total Pathway Noncancer Hazard Index* Pre-Landfill AVG	Pre-Landfill MAX	BRL Site AVG	BRL Site MAX	Total Pathway Cancer Risk** Pre-Landfill AVG	Pre-Landfill MAX	BRL Site AVG	BRL Site MAX
Table C-6	Benwood	Ingestion	3.58E-01	3.74E-01	4.25E-01	6.59E-01	2.16E-04	2.16E-04	2.16E-04	2.18E-04
Table C-7	Mine Spoils	Ingestion	1.21E+00	1.85E+00	1.99E+00	4.78E+00	7.43E-04	1.17E-03	1.31E-03	3.18E-03
Table C-8	Redstone	Ingestion			6.41E+00	1.54E+01			4.52E-03	1.08E-02
Table C-9	Uniontown	Ingestion	3.36E-01	3.97E-01	3.65E-01	6.20E-01	1.04E-05	1.04E-05	1.13E-05	2.00E-05
Table C-10	Waynesburg	Ingestion	9.94E-01	1.63E+00	8.07E-01	2.21E+00	6.97E-04	1.13E-03	5.77E-04	1.56E-03
Table C-11	Wegee	Ingestion	9.94E-01	1.63E+00	4.97E-01	9.03E-01	6.96E-04	1.12E-03	2.82E-04	3.42E-04
		MAXIMUM:	1.21E+00	1.85E+00	6.41E+00	1.54E+01	7.43E-04	1.17E-03	4.52E-03	1.08E-02
Table C-15	Benwood	Inhalation					2.90E-05	2.90E-05	3.28E-05	5.83E-05
Table C-16	Mine Spoils	Inhalation					1.34E-03	1.34E-03	1.24E-03	1.36E-03
Table C-17	Redstone	Inhalation			5.34E-03	9.85E-03			5.23E-05	8.72E-05
Table C-18	Uniontown	Inhalation	4.11E-03	4.11E-03	3.90E-03	4.11E-03	1.77E-04	1.77E-04	1.91E-04	3.34E-04
Table C-19	Waynesburg	Inhalation					2.91E-05	2.91E-05	4.75E-05	1.63E-04
Table C-20	Wegee	Inhalation								
		MAXIMUM:	4.11E-03	4.11E-03	5.34E-03	9.85E-03	1.34E-03	1.34E-03	1.24E-03	1.36E-03
Table C-22	Benwood	Dermal	2.51E-03	3.01E-03	4.57E-03	1.13E-02	1.04E-06	1.04E-06	1.09E-06	1.42E-06
Table C-23	Mine Spoils	Dermal	5.42E-02	5.64E-02	5.37E-02	6.98E-02	1.29E-05	1.42E-05	1.42E-05	2.15E-05
Table C-24	Redstone	Dermal			3.32E-02	8.38E-02			1.89E-05	4.78E-05
Table C-25	Uniontown	Dermal	4.84E-02	4.89E-02	4.84E-02	5.93E-02	2.31E-06	2.31E-06	2.50E-06	4.37E-06
Table C-26	Waynesburg	Dermal	5.03E-03	7.30E-03	4.87E-03	1.15E-02	3.88E-06	5.19E-06	3.75E-06	8.26E-06
Table C-27	Wegee	Dermal	5.03E-03	7.30E-03	6.25E-03	1.56E-02	3.50E-06	4.81E-06	2.29E-06	2.69E-06
		MAXIMUM:	5.42E-02	5.64E-02	5.37E-02	8.38E-02	1.29E-05	1.42E-05	1.89E-05	4.78E-05
Table C-12	Surface Water	Ingestion	9.91E-01	2.75E+00	1.31E+00	5.69E+00	5.72E-04	1.65E-03	7.41E-04	2.56E-03
Table C-14	Soils	Ingestion	1.44E-02	2.11E-02	2.54E-02	7.79E-02	1.30E-05	2.59E-05	1.58E-05	4.52E-05
Table C-29	Soils	Dermal	4.84E-03	8.72E-03	8.94E-03	2.23E-02	3.22E-06	6.34E-06	5.50E-06	1.36E-05
Site Total for Potential Exposures			2.28E+00	4.69E+00	7.81E+00	2.13E+01	2.68E-03	4.21E-03	6.54E-03	1.48E-02

*Hazard indices >1.0 indicate that the potential exists for non-carcinogenic effects from exposure to chemical concentrations detected at the BRL site.
**Cancer risks >1.0E-06 indicate that the potential exists for carcinogenic effects from exposure to chemical concentrations detected at the BRL site.

Table 4. Summary of Noncancer Hazard Calculations for Off-site Residential Wells*

Appendix C Table	Environmental Media	Exposure Route	Total Pathway Noncancer Hazard Index** Background	BRL Site AVG	BRL Site MAX
Table C-13	Residential	Ingestion	2.86E-02	2.97E-02	3.49E-02
Table C-21	Residential	Inhalation			
Table C-28	Residential	Dermal	5.54E-03	5.74E-03	6.76E-03
Resdential Well Total			3.41E-02	3.54E-02	4.17E-02

*Cancer risk values were not calculated for the indicator constituents in the off-site residential wells. Cancer slope factors have not been developed by U.S. EPA for any of the three indicator constituents identified in the off-site residential wells for the relevant exposure routes.

**Hazard indices >1.0 indicate that the potential exists for non-carcinogenic effects from exposure to chemical concentrations detected in the off-site residential wells.

Table 5. Summary of Total Site Risk (Existing and Potential Exposure Pathways) For Chemical Contaminants at the BRL Site

	Noncancer Hazard* Associated With Average Chemical Concentrations	Noncancer Hazard* Associated With Maximum Chemical Concentrations	Cancer Risk* Associated With Average Chemical Concentrations	Cancer Risk* Associated With Maximum Chemical Concentrations
BRL Site Conditions				
Existing Exposures	1.45E-02	4.56E-02	3.76E-04	1.05E-03**
Potential Exposures	7.81E+00	2.13E+01	6.54E-03	1.48E-02**
Pre-Landfill Conditions				
Existing Exposures	1.04E-02	1.76E-02	2.34E-04	4.00E-04
Potential Exposures	2.28E+00	4.69E+00	2.68E-03	6.21E-03
Recommended Criterion	1.00E+00	1.00E+00	1.00E-06	1.00E-06

*Hazard and risk values estimates are unitless indices.
**Exceedances of recommended criteria values indicate that the levels of contaminants at a site may potentially cause adverse noncancer or carcinogenic effects.

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TABLE 6. DENSITY, BIOMASS, AND MEAN LENGTH OF FISH CAPTURED AT EIGHT STATIONS IN THE LITTLE McMAHON CREEK WATERSHED, BELMONT COUNTY, OHIO, JUNE 25-26, 1987. SAMPLE SIZE OF MEAN LENGTH MEASUREMENTS (n_x) AND STANDARD DEVIATION ARE SHOWN IN PARENTHESIS (continued)

	Station							
Species	1	2*	3	4	5*	6*	7*	8
WHITE SUCKER								
Number per 50m	1	-	-	-	-	-	-	-
Biomass(g) per 50m	13.4	-	-	-	-	-	-	-
Mean length(mm) (n_x std. dev.)	111(1,0)	-	-	-	-	-	-	-
Catchability	1.00	-	-	-	-	-	-	-
ALL SPECIES								
TOTAL NUMBER per 50m	160	0	10	3	0	0	1	120
TOTAL BIOMASS per 50m	860.4	0	113.1	16.4	0	0	20.6	475.7
Index of Biotic Integrity (IBI)	34	N/A	22	22	N/A	N/A	22	30
IBI Classification	Poor	No Fish	Very Poor	Very Poor	No Fish	No Fish	Very Poor	Poor

TABLE 6. DENSITY, BIOMASS, AND MEAN LENGTH OF FISH CAPTURED AT EIGHT STATIONS IN THE LITTLE McMAHON CREEK WATERSHED, BELMONT COUNTY, OHIO, JUNE 25-26, 1987. SAMPLE SIZE OF MEAN LENGTH MEASUREMENTS (n_x) AND STANDARD DEVIATION ARE SHOWN IN PARENTHESIS

Species	Station 1	2*	3	4	5*	6*	7*	8
BLACKNOSE DACE								
Number per 50m	69	-	3	-	-	-	-	1
Biomass(g) per 50m	184.0	-	10.1	-	-	-	-	0.8
Mean length(mm) (n_x std. dev.)	63.8 (26,9.49)	-	65.7 (3,4.93)	-	-	-	-	46 (1,0)
Catchability	.88	-	0.50	-	-	-	-	1.0
CREEK CHUB								
Number per 50m	87	-	10	3	-	-	1	12
Biomass(g) per 50m	596.0	-	68	16.4	-	-	20.6	97.4
Mean length(mm) (n_x std. dev.)	87.3 (36,19.14)	-	79.8 (10,9.30)	76.7 (3,11.50)	-	-	115 (1,0)	78.3 (12,27.
Catchability	0.39	-	<0	1.00	-	-	1.00	0.80,1.00**
***LEPOMIS* HYBRID**								
Number per 50m	11	-	5	-	-	-	-	107
Biomass(g) per 50m	67.0	-	35.0	-	-	-	-	377.5
Mean length(mm) (n_x std. dev.)	71.3 (7,13.14)	-	67.6 (5,20.90)	-	-	-	-	51.8 (33,7.6
Catchability	0.43	-	<0	-	-	-	-	0.53,0.74**

* Single pass estimates.

** Second-third pass catchability.

TABLE 6. BENTHIC INVERTEBRATE TAXA COLLECTED FROM ARTIFICIAL SUBSTRATE SAMPLERS DEPLOYED AT 8 STATIONS IN AND NEAR THE BUCKEYE RECLAMATION LANDFILL, BELMONT COUNTY, OHIO, DURING JUNE 26 - AUGUST 6, 1987

	Station							
Taxa	1	2	3	4	5	6	7	8
Turbellaria			2					2
Hydracarina			16			1		
Oligochaeta	27		36	23	2	5	92	8
Crustacea								
Isopoda	1		10	3	1			2
Amphipoda								
<u>Gammarus</u>	13			1				16
Decopoda	4							
Gastropoda	17		12		1			14
Collembola			7					1
Ephemeroptera	20		1	1				1
Trichoptera	24		4	12		1		1
Odonata	2			1				3
Hemiptera	1	1	9					
Megaloptera		1	2					2
Coleoptera	21		20	40				2
Diptera	236	1	119	186	5	15	1	95
Chironomidae	217		42	161			1	89
Ceratopogonidae				8	2	3		
<u>Chaoborus</u> sp.				1	1			
Total	374	3	238	268	8	22	93	147

ATTACHMENT A

Authorization to discharge to Little McMahon Creek

In compliance with the provisions of the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et. seq.) and the Ohio Water Pollution Control Act (Ohio Revised Code Section 6111),

Buckeye Reclamation Landfill

is authorized by the Ohio Environmental Protection Agency, hereafter referred to as "Ohio EPA", to discharge from the treatment system located approximately 4 miles south of St. Clairsville, Ohio in Belmont County in accordance with the conditions specified below:

A.1. FINAL EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS FOR THE BUCKEYE RECLAMATION LANDFILL

Buckeye Reclamation Landfill (the entity) is authorized to discharge in accordance with the following limitations and monitoring requirements from the wastewater treatment works, beginning on the first day of authorized discharge and lasting until 44 months from the date the twelfth bioassay is completed (in accordance with the provisions contained in Paragraph C, below):

EFFLUENT CHARACTERISTIC		DISCHARGE LIMITATIONS*				MONITORING REQUIREMENT	
		Concentration Other Units (Specify)		Loading kg/day			
REPORTING CODE/UNITS	PARAMETER	30 DAY	DAILY	30 DAY	DAILY	Measurement Frequency	Sample Type
01002 UG/L	Arsenic, Total (As)	—	521	—	1.41	2/Week	Grab
01012 UG/L	Beryllium, Total	6.7	13480	0.018	36.38	2/Week	Grab
01027 UG/L	Cadmium, Total	14	57	0.038	0.15	2/Week	Grab
01034 UG/L	Chromium, Total	517	11,300	1.40	30.5	2/Week	Grab
01042 UG/L	Copper, Total	—	157	—	0.424	2/Week	Grab
34371 UG/L	Ethylbenzene	—	—	—	—	2/Week	Grab
39100 UG/L	Bis(2-ethylhexyl)phthalate	43	1,594	0.12	4.302	1/Month	Grab
01051 UG/L	Lead, Total	253	1,883	0.683	5.08	2/Week	Grab
71900 UG/L	Mercury, Total	0.04	1.6	0.0001	0.0043	2/Week	Grab
01067 UG/L	Nickel, Total	—	—	—	—	2/Week	Grab
01077 UG/L	Silver, Total	7.2	51	0.019	0.14	2/Week	Grab
01092 UG/L	Zinc, Total	—	764	—	2.06	2/Week	Grab
78396 UG/L	4-Methylphenol, Total	21	202	0.057	0.545	2/Week	Grab
00610 MG/L	Nitrogen, Ammonia (NH_3) Summer	6	—	16	—	2/Week	Grab
	Winter	—	—	—	—	2/Week	Grab
01097 UG/L	Antimony, Total	—	942	—	2.54	2/Week	Grab
00981 UG/L	Selenium	24	29	0.065	0.078	2/Week	Grab
22456 UG/L	PAHs***	1.8	—	0.0048	—	1/Month	Grab
78356 MG/L	2-Butanone	—	—	—	—	1/Month	Grab
34694 UG/L	Phenol	—	—	—	—	2/Week	Grab
61425 TUa	Acute Toxicity, <u>Ceriodaphnia</u>	—	—	—	—	See Paragraph C, Below	
61427 TUa	Acute Toxicity, <u>Pimephales promelas</u>	—	—	—	—	See Paragraph C, Below	

(CONTINUED)

A.1. FINAL EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS FOR THE BUCKEYE RECLAMATION LANDFILL (Continued)

EFFLUENT CHARACTERISTIC		DISCHARGE LIMITATIONS*				MONITORING REQUIREMENT	
		Concentration Other Units (Specify)		Loading kg/day			
REPORTING CODE/UNITS	PARAMETER	30 DAY	DAILY	30 DAY	DAILY	Measurement Frequency	Sample Type
50050 MGD	Flow Rate	—	—	—	—	Daily	24 Hr. Tota
00550 MG/L	Oil and Grease, Total	15	20	—	—	1/Month	Grab
00530 MG/L	Residue, Total Nonfilterable	30	45	—	—	1/Month	Grab
00310 MG/L	Biochemical Oxygen Demand, 5 day					1/Month	Grab
00680 MG/L	Total Organic Carbon	—	—	—	—	1/Month	Grab
00335 MG/L	Chemical Oxygen Demand	—	—	—	—	1/Month	Grab
99997	Carcinogen Additivity Factor**	—	1(max)	—	—	1/Month	Calculated

* Effluent limitations have been established using a flow value of 0.713 MGD.

** The 30-day average reported values obtained in the monthly sampling period for the following parameters shall be used in the carcinogenic additivity factor evaluation:

Parameter	Average Reported Value (ug/l)
Beryllium	A
Bis(2-ethylhexyl)phthalate	B

The carcinogen additivity factor shall be calculated using the following equation:

$$\frac{A}{6.7\ \text{ug/l}} + \frac{B}{344\ \text{ug/l}}$$

*** The polycyclic aromatic hydrocarbon (PAH) criteria apply to the sum of anthracene, benzo(a)anthracene, benzo(k)flouranthene, 3,4-benzofluoranthene, benzo(b)flouranthene), benzo (g,h,i)perylene, benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, flourene, indeno(1,2,3-c,d)pyrene, naphthalene, phenanthrene and pyrene.

B.1. The pH (Reporting Code 00400) shall not be less than 6.5 S.U. nor greater than 9.0 S.U. and shall be monitored 2/Week by grab sample.

5 S

A.2. FINAL EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS FOR THE BUCKEYE RECLAMATION LANDFILL

Buckeye Reclamation Landfill is authorized to discharge in accordance with the following limitations and monitoring requirements from the wastewater treatment works, beginning 44 months from the date the twelfth monthly bioassay is completed (in accordance with the provisions contained in Paragraph C below) and lasting until the treatment works are no longer in service and there is no discharge from the facility or until these requirements are modified:

EFFLUENT CHARACTERISTIC		DISCHARGE LIMITATIONS*				MONITORING REQUIREMENT	
		Concentration Other Units (Specify)		Loading kg/day			
REPORTING CODE/UNITS	PARAMETER	30 DAY	DAILY	30 DAY	DAILY	Measurement Frequency	Sample Type
01002 UG/L	Arsenic, Total (As)	—	521	—	1.41	2/Week	Grab
01012 UG/L	Beryllium, Total	6.7	13480	0.018	36.38	2/Week	Grab
01027 UG/L	Cadmium, Total	14	57	0.038	0.15	2/Week	Grab
01034 UG/L	Chromium, Total	517	11,300	1.40	30.5	2/Week	Grab
01042 UG/L	Copper, Total	—	157	—	0.424	2/Week	Grab
34371 UG/L	Ethylbenzene	—	—	—	—	2/Week	Grab
39100 UG/L	Bis(2-ethylhexyl)phthalate	43	1,594	0.12	4.302	1/Month	Grab
01051 UG/L	Lead, Total	253	1,883	0.683	5.08	2/Week	Grab
71900 UG/L	Mercury, Total	0.04	1.6	0.0001	0.0043	2/Week	Grab
01067 UG/L	Nickel, Total	—	—	—	—	2/Week	Grab
01077 UG/L	Silver, Total	7.2	51	0.019	0.14	2/Week	Grab
01092 UG/L	Zinc, Total	—	764	—	2.06	2/Week	Grab
78396 UG/L	4-Methylphenol, Total	21	202	0.057	0.545	2/Week	Grab
00610 MG/L	Nitrogen, Ammonia (NH_3) Summer	6	—	16	—	2/Week	Grab
	Winter	—	—	—	—	2/Week	Grab
01097 UG/L	Antimony, Total	—	942	—	2.54	2/Week	Grab
00981 UG/L	Selenium	24	29	0.065	0.078	2/Week	Grab
22456 UG/L	PAHs***	1.8	—	0.0048	—	1/Month	Grab

(CONTINUED)

A.2. FINAL EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS FOR THE BUCKEYE RECLAMATION LANDFILL (Continued)

EFFLUENT CHARACTERISTIC		DISCHARGE LIMITATIONS*				MONITORING REQUIREMENT	
		Concentration Other Units (Specify)		Loading kg/day			
REPORTING CODE/UNITS	PARAMETER	30 DAY	DAILY	30 DAY	DAILY	Measurement Frequency	Sample Type
78356	2-Butanone	—	—	—	—	1/Month	Grab
34694 UG/L	Phenol	—	—	—	—	2/Week	Grab
61425 TUa	Acute Toxicity, Ceriodaphnia	—	1.5	—	—	See Paragraph C, Below	
61427 TUa	Acute Toxicity, Pimephales promelas	—	1.5	—	—	See Paragraph C, Below	
50050 MGD	Flow Rate	—	—	—	—	Daily	24 Hr. Total
00550 MG/L	Oil and Grease, Total	15	20	—	—	1/Month	Grab
00530 MG/L	Residue, Total Nonfilterable	30	45	—	—	1/Month	Grab
00310 MG/L	Biochemical Oxygen Demand, 5 day					1/Month	Grab
00680 MG/L	Total Organic Carbon	—	—	—	—	1/Month	Grab
00335 MG/L	Chemical Oxygen Demand	—	—	—	—	1/Month	Grab
99997	Carcinogen Additivity Factor**	—	1(max)	—	—	1/Month	Calculated

* Effluent limitations have been established using a flow value of 0.713 MGD.

** The 30-day average reported values obtained in the monthly sampling period for the following parameters shall be used in the carcinogenic additivity factor evaluation:

Parameter	Average Reported Value (ug/l)
Beryllium	A
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The carcinogen additivity factor shall be calculated using the following equation:

$$\frac{A}{6.7\ \text{ug/l}} + \frac{B}{344\ \text{ug/l}}$$

*** The polycyclic aromatic hydrocarbon (PAH) criteria apply to the sum of anthracene, benzo(a)anthracene, benzo(k)flouranthene, 3,4-benzofluoranthene, benzo(b)flouranthene), benzo (g,h,i)perylene, benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, flourene, indeno(1,2,3-c,d)pyrene, naphthalene, phenanthrene and pyrene.

B.2. The pH (Reporting Code 00400) shall not be less than 6.5 S.U. nor greater than 9.0 S.U. and shall be monitored 2/Week by grab sample.

C. Biomonitoring requirements for Buckeye Reclamation Landfill

As soon as possible, but not later than three months after treatment has been installed to meet final chemical-specific limits, the entity shall initiate an effluent biomonitoring program to determine the toxicity of effluent from Buckeye Reclamation Landfill.

Testing Requirements:

1. Acute Bioassays:

The entity shall conduct monthly 48-hour acute bioassays using Ceriodaphnia and 96-hour acute bioassays using the fathead minnow (Pimephales promelas) for a period of one year. If discharges are intermittent and do not occur on a monthly basis, then 12 acute bioassays shall be completed with no more than 1 bioassay occurring per every four weeks per calendar month. The tests shall be conducted using 24-hour composite samples of final effluent from outfall 001. In addition, an instream grab sample will be tested to determine near field toxicity. See item 4 under testing protocol for specifics on sampling locales.

2. Chemical Analysis:

A sufficient volume of effluent shall be collected to allow for chemical analysis. Bioassay effluent sampling may be coordinated with other sampling requirements as appropriate to avoid duplication. The analyses detailed in the Final Effluent Limitations and Monitoring Requirements tables should be conducted for the effluent sample. In addition, alkalinity and hardness (as $CaCO_3$) should also be measured. Chemical analysis must comply with Ohio EPA accepted procedures.

Testing Protocol:

1. The test shall be conducted using procedures contained in the Ohio EPA Quality Assurance Manual (or current revisions). Any request to use a different methodology must be approved by the OEPA prior to the initiation of testing.

2. The entity shall determine a median lethal concentration (LC50) and/or median effective concentration (EC50) for acute effects.

3. A minimum of 5 effluent concentrations (e.g., 100, 56, 32, 18, and 10 percent by volume effluent) shall be used in each effluent bioassay. Dilution and control water shall be collected as a grab sample at Station 801 (a site upstream from the outfall outside the zone of effluent and receiving water interaction). Reconstituted water, rearing unit water (water in which the test organisms were reared) or other high quality water shall be used as a second control water. If the primary control and dilution water from Station 801 is demonstrated to contain unacceptable toxicity in a test, then the secondary control shall be used as the diluent in succeeding tests until water from Station 801 is shown to be acceptable for use as a diluent in three successive bioassays where it has been tested at full-strength (i.e., no dilutions). An acute test shall be repeated if mortality, or combination of mortality plus other adverse effects, exceeds ten percent of one of the species of test organisms in both control waters (primary and secondary).

4. Testing of ambient water shall be conducted as follows. In conjunction with the acute tests of the effluent, an instream grab sample shall be collected at Station 901 (a point located within the effluent plume 3 meters (10 feet) downstream from outfall 001). The location of the effluent plume should be confirmed at the time of sampling using temperature measurements, conductivity measurements or a dye study. Bioassays of these instream samples will determine if near field toxicity is occurring.

Responsiveness Summary for the Record of Decision

I. Overview

Public reaction to the Proposed Plan was mixed. A number of citizens expressed concern over the high cost of the proposed remedy. Some were doubtful that health risks at the site had been characterized accurately and that the expensive remedy was justified due to the Agencies' risk estimates. Comments supporting the proposed alternative were also submitted by the public. The Potentially Responsible Party (PRP) group submitted comments regarding several of the Agencies' assumptions and conclusions in the Remedial Investigation and Endangerment Assessment.

II. Background on Community Involvement

The following are the community relations activities conducted at the Buckeye Reclamation Landfill Superfund site (BRL site) from the completion of the Feasibility Study to the end of the public comment period.

1. U.S. EPA and Ohio EPA prepared a Proposed Plan in May 1991 for release to the public at the beginning of the public comment period. A fact sheet, which summarized the proposed plan, was also distributed to individuals on the mailing list. The Administrative Record was placed in local information repositories at the St. Clairsville Public Library and the Neffs Branch of the Martins Ferry Public Library.

2. U.S. EPA placed public notices on May 13, 1991 in local newspapers including The Intellingencer, Wheeling, West Virginia and The Times - Leader, Martins Ferry, Ohio to announce the beginning of the public comment period. The notice also announced a public meeting which was held on May 30, 1991.

3. U.S. EPA and Ohio EPA conducted a public meeting on May 30, 1991, to explain the details of the Remedial Investigation /Feasibility Study and Proposed Plan, to answer questions from interested members of the community, and to accept pubic comments from the community. A court reporter was present to record the meeting. U.S. EPA distributed the Proposed Plan fact sheet at the meeting.

4. A request for a 10 day extension to the public comment period was made on May 31, 1991. U.S. EPA granted the extension, which ran until June 26, 1991.

5. U.S. EPA placed a public notice in The Intellingencer and The Times - Leader announcing the extension to the public comment period.

III. Summary of Public Comments and Lead Agency Response

Comments 1 through 16 were raised in oral comments at the public meeting and in written comments:

1. Comment

The situation at the landfill could have been avoided in 1987 because the Agencies knew of the gob (coal mine spoil) pile, creeks and runoff.

Response

U.S.EPA was aware of potential problems at the Buckeye Reclamation Landfill site in 1987. The site had been placed on the Superfund National Priorities List on September 8, 1983. However, the Agencies did not have enough environmental data to characterize the site and select an appropriate remedy until the end of the remedial investigation.

2. Comment

Landfills should be done away with as much as possible. Recycling is the answer to the garbage and hazardous waste problem.

Response

The Agency agrees and supports all recycling efforts. However, landfills will be necessary for at least the foreseeable future or until consumer product manufacturing and disposal trends change.

3. Comment

With forty-eight million the Agencies could build an incinerator on the site.

Response

Incineration of on-site soils was considered in the earlier phases of the Feasibility Study. It was eliminated as a treatment option because it is more effective for volatile and semivolatile organic compounds. Further treatment and/or disposal would be required for the residual ash which would contain elevated metal concentrations. Incineration would be difficult to implement and capital and operation & maintenance costs would be high. Costs would be further increased due to the treatment and/or disposal costs for the residue ash. Additional costs to the overall remedy associated with incineration of the Waste Pit soils may have been as much as 20 million.

4. Comment

Closing of old landfills leads to the requirement that new landfills be constructed for garbage disposal in the same locality. Under recently passed legislation, it costs approximately ten million dollars to establish new landfills. The cost to dump in new landfills will increase greatly. More people will illegally dump rather than pay increased fees. Thusly, new laws aimed at protecting the environment lead to degradation of it.

Response

The Agency disagrees with this comment. Examples which illustrate progress toward making the environment safer and cleaner are evident throughout the nation's land, air and water. Much of this progress is the direct result of laws passed by Congress to protect the environment and an increased public awareness of the benefits of a clean environment. The economic costs seem high because they were largely ignored in the past. As the nations economy switches toward the inclusion of environmental cost as a cost of doing business, the dollars spent on disposal and waste will actually drop.

5. Comment

The gob (coal mine refuse) that is exposed at the bottom of the landfill shows high clay content -- a perfect sealer for a landfill. In essence, the location of this site and composition is perfect for a landfill.

Response

The coal mine refuse may have a high clay content, but it also contains a large fraction of coarse grained particles, which increase the permeability of the material. If the coal mine refuse was a perfect sealer, there should be no leachate discharges from the site, however, this is obviously happening. Ground water monitoring data has also demonstrated that contaminants found in the waste pit have migrated out of it and moved downgradient. In summary, the materials and location of this landfill are really no different from any landfill which is not an engineered structure. There are problems with the Buckeye Reclamation Landfill which the studies have identified and the Agency intends to address.

6. Comment

What's the big danger that EPA has found with this landfill? A number of contaminants such as benzene, arsenic, and chromium which exceed Federal safe drinking water standards -- but no one is drinking the water from the site! Your report states that "Concentrations of ground water contaminants decreased below detection limits before moving beyond site boundaries." (i.e. this means no contamination from those previously mentioned are moving off-site.)

Response

The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) mandates that the Agency implement remedies which ensure long-term protection of human health and the environment utilizing institutional controls only when no other remedy will work. The presence of the contaminants mentioned above in the on-site ground water indicates a potential for further future releases. The Agency can not rely on happen stance and luck to assure the contamination stays put. Buckeye Reclamation Landfill is a fairly young landfill. Its peak gas and leachate production probably won't occur for ten years or more. The Agency, therefore, must take measures now to prevent off-site migration of the contaminants before the current situation becomes worse.

7. Comment

"Surface water samples collected form nearby creeks and leachate seeps detected contamination from both acid mine drainage and the landfill. This type of leachate can be neutralized and treated by the use of crushed limestone and the construction of wetlands or bogs utilizing cattails.

Response

The Agency agrees that this type of leachate can be treated with constructed wetlands. However, the Agency would like to stress that for this system to perform effectively and reliably, it must be carefully evaluated and designed. The treatment system must comply with regulations which establish discharge limits for the treated water. Because of this, treating the leachate is not as easy as lining the creeks with limestone and planting cattails.

8. Comment

There is mention of an "industrial waste pit" in which high levels of contamination were found. This pit is only approximately one half acre in size and nearly in the middle of the landfill, and it is covered with top soil and growing grasses. Three of the twenty-four monitoring wells drilled are found only 40 yards and below this pit, and it's my understanding that these wells show no migration of the contaminants from the pit. One must assume that the industrial waste is staying right where it was put.

Response

Monitoring data collected during the Remedial Investigation does not support this statement. Relatively high levels of three volatile organic compounds (VOCs), which were identified as chemicals of concern and detected in the waste pit, were detected in monitoring well MW-4A. This well is located approximately 100 feet east of, and downgradient from, the waste pit. Relatively small amounts of two of these VOCs were also detected in monitoring well MW-7A it is likely but not certain that these VOCs are originating from the waste pit too. In summary, monitoring data does show that contaminants are slowly leaking from the waste pit.

9. Comment

The Endangerment Assessment report states that "current existing human exposure to site contaminants occurs when people enter the site and inhalation of contaminated dust over a long period of time poses a potential risk of cancer". The site is closed down and there will be no long-term exposure, nor will there be any substantial amount of dust since there are grasses growing over most of the site.

Response

The current risk calculations performed in the Endangerment Assessment considered trespassers entering the site for the purpose of dirt biking. This activity was observed during performance of field work for the Remedial Investigation. Even though the site is now closed, the Agency assumes dirt biking and other forms of trespassing activities will continue and therefore the risks calculated in the Endangerment Assessment will continue to exist.

10. Comment

The findings also mention that "direct contact with and long-term ingestion of surface waters, soils, and ground water could result in an unacceptable level of noncancerous or cancerous human health risks". Who is going to drink the ground water from the site or eat the dirt from the landfill over a long period of time or even over a short period of time? No one, of course!

Response

The findings referred to in the comment above concern potential future-use risks which may be posed by the site if it were used for residential purposes. It is the Agency's policy to calculate risks under a reasonable worst case situation as a means of establishing a base-line for comparison of remedial alternatives. The Agency chose to use the residential use situation for the reasonable worst case scenario at this site. The Endangerment Assessment calculations showed that potential residents on the site could be exposed to unacceptable health risks. Therefore, the Agency must take measures to assure the risks are minimized.

11. Comment

"Proposed [Potentially] Responsible Parties", certain companies, are being told they have to "fork out" 48+ million dollars to cap the landfill. It's already almost all covered with top soil and planted and growing grass. Why not leave it as it is? It's not hurting anyone and I'll bet won't hurt anyone in the future. Put some limestone in the creeks and plant some cattails in wetlands and it will be fixed.

Response

It is true that the site is covered with soil which is growing grasses. The existing cover, however, was not engineered to minimize infiltration of water, as is required by law for solid waste landfills. Minimizing infiltration of surface water will inhibit contamination migration and decrease leachate generation, effectively reducing health and environmental risks posed by the site. In order to assure that the site poses minimized risk over the long-term, a cap is a necessary component of the remedy. The Agency does intend to use constructed wetlands for treatment of collected leachate and ground water, however the wetlands will be properly designed to assure the collected waters are treated sufficiently to meet appropriate discharge limits.

12. Comment

We have to do away with landfills because we're destroying the lands. We're making more people but we don't make more land. There's 50 acres down there (the Buckeye site) that nobody can use or live on. We keep continuing building more landfills but we don't figure out a way to recycle our waste.

Response

The Agency fully supports waste minimization and recycling efforts as a means of preserving the environment. Also see response to comment 4.

13. Comment

The landfill was constructed on the mine spoilage (refuse). The reason it was constructed on the mine spoilage was -- it was a waste area, why not put a dump on it. We'll put our garbage on it, cover it up, put grass on it when it is done and have a nice area when it was done. I certainly believe that's the thought behind that landfill.

Response

The Agency can not speculate on what the intentions were for locating the landfill in the Kings Run valley.

14. Comment

The thing I fear most about your proposal is the costs and its benefits. There is an awful lot of acid mine drainage that comes into Little McMahon Creek, not only from the landfill area but from other areas. I can't see spending 48.6 million dollars, or whatever that figure is, when you have other areas, other acid mine drainage coming off into those creeks.

Response

The remedial action which has been selected for the Buckeye Reclamation Landfill site is not exclusively a mine reclamation project. The components of the remedy serve to minimize infiltration of surface water into the landfilled area, collect landfill leachate and ground water (much of which is also acid mine drainage impacted), treat the collected waters and possibly implement institutional controls on the site property. The goal of the remedy is to prevent off-site migration of contaminants and treat contaminated waters which do move off-site. Acid mine drainage is not the only problem identified at this site as evidenced by the presence of man-made chemicals.

15. Comment

I don't know whether Belmont County is going to end up having to pay for this or not. I feel like the Agencies are penalizing the local people that own that landfill, causing them and some of the other dumpers to come up with all this money to repair all of this when your studies show that all the metals and everything that is coming out of the landfill is coming out of that acid mine drainage.

Response

First, Belmont County is not the only potentially responsible party at this site. The Agency will attempt to negotiate an agreement with a number of potentially responsible parties (PRPs) for the performance of the remedial design and remedial action. Second, the Agency studies show that man-made contaminants, which could not have come from acid mine drainage, are present at the landfill. Sample analyses also showed high concentrations of metals, some of which could have been released from industrial wastes disposed at the Buckeye Reclamation Landfill site. The acid mine drainage is not the primary reason Superfund is conducting a remediation at this site.

16. Comment

I can't see where you are being fair in wanting to have PRPs put all this money out when the original intent of the landfill was to cover all the mine refuse anyway. I think you are penalizing those people very unjustly for the benefits that will be derived.

Response

Regardless of the original intent of the landfill, the studies performed by the Agency have concluded that an already degraded situation at the Buckeye Reclamation Landfill site was made worse by landfilling. The selected remedy is similar to the sort of landfill closure which is required under State of Ohio solid waste regulations. All solid waste landfills in Ohio are required by Ohio law to be covered in a proper manner and provide for leachate collection and treatment. The Agency does not intend to penalize any party, only to protect human health and the environment.

Comments 17 through 27 were submitted by the Buckeye Reclamation Landfill Steering Committee. Because most of these comments are lengthy, they have been summarized in this responsiveness summary. The complete comments can be found in the administrative record for the Buckeye Reclamation Landfill Site.

17. Comment

The final RI Report states that "the flow system in the mine spoil is complicated because of its heterogeneity. It involves not a single, uniform water table but a series of semi-isolated saturated zones, some with fairly extensive water tables, coexisting in places with more local, semiperched water tables." Final RI p. 142. The conclusions expressed in this quote are entirely without support and inconsistent with the information and data collected during the RI. The data collected during the RI indicates that the water table (in the mine refuse zone) is a single saturated zone which exists at the base of the unconsolidated material, and occurs due to the permeability contrast between the unconsolidated materials and the relatively impermeable virgin soil horizon or bedrock formations below (although leakage surely occurs).

Response

The Agency has determined that hydrologic description provided for the mine refuse zone in the above comment may be an oversimplification of the situation. The Agencies contend that data from the RI shows that in places where the mine refuse is relatively thin, as at MW-6A (36 feet) and MW-11A (17 feet), it is dry. In the other monitoring wells (MW-2A, MW-7A, MW-8A, MW-9A and MW-12A), where thicknesses of mine refuse range from 40 to 100 feet, the mine refuse is partially saturated. Therefore, moving from north to south within the mine refuse on-site, a continuous ground water table may not be present as is implied in the above comment. The above comment took special exception to the use of "semi-perched" in describing the ground water conditions in the mine refuse. This term was intended to describe ground water levels which were measured higher up on the ridge which separates Kings Run and Unnamed Run. Because of the heterogeneity of the mine refuse in the landfill area, the Agency concluded that some of these topographically higher ground water measurements could have resulted from restricted downward percolation of water in localized areas.

18. Comment

The draft RI Report contained important observations and data regarding recharge to bedrock formations. Although the data was consistent with other site data, the Final RI Report ignored the information, and as a result, fundamental site hydrogeologic observations and descriptions were lost. This comment takes special exceptions to revisions performed by the Agencies regarding ground water recharge and discharge from the Redstone Limestone and Sewickly Coal.

Response

The Agency determined that careful examination of drilling data is required or else erroneous conclusions may be made as to which units are or are not water bearing. An example of what is believed to be such a misinterpretation is the statement in the above comment that the Sewickley Coal is not water bearing at the site. This all inclusive statement is based on the loss, during drilling, of approximately 3750 gallons of water in MW-5C between depths of 216 and 295 feet (a 79-foot interval that includes the Sewickley Coal), plus the fact that the well, having been "blown dry", failed to "recharge". The Agency was not told how much time was allowed to reenter the well, a process that conceivably could take several hours or even days. Moreover, there is no evidence presented that the water was indeed lost in the Sewickley Coal and not in permeable zones above or below the coal.

The statement also implied in this comment that the Sewickley Coal and Redstone Limestone are "naturally dry" because they "lack recharge areas" is not correct. Both units crop out on the sides of the ridge where they are exposed to recharge by precipitation, similar to the other beds that underlie the site.

The question of why wells MW-1C and MW-5C were dry was not addressed to the satisfaction of the Agency in this comment.

According to mine maps of the Ohio Division of Reclamation, the Pittsburgh Coal had been essentially mined out, except for pillars and walls required for roof support, over the entire site. It is common practice in underground mining to remove, for safety reasons, incompetent beds of clay and shale overlying the coal. It is this material that makes up most of the mine spoil now piled on the surface. In this instance, removal of these overlying beds would allow water in the Redstone Limestone to drain into the abandoned mine, probably at a rate faster than it can enter the limestone by normal recharge.

The hypothesis of drainage into the underlying mines to account for the absence of water in the Redstone Limestone at wells MW-1C and MW-5C is strengthened by statements relative to the Redstone Limestone in the Final RI, p. 164: "During the drilling of MW-5C, the drill stem encountered a void and abruptly dropped one-half foot..." "Drilling fluids were rapidly lost ... indicating substantial porosity and permeability at MW-5C; however, the formation is dry at this location." Drainage into the mine would seem a logical explanation of why this permeable unit was dry at these well sites. The underlying mines may not be dry everywhere, however, because of unevenness of the old mine floors, possibly accounting for the fact that the Redstone Limestone is water bearing in places, as at the sites of wells MW-10C and MW-12C. It is possible that local mounding of the water table offers increased local recharge to the Redstone Limestone as is proposed in the comment, but the Agency believes drainage to the under ground mine theory is better.

19. <u>Comment</u>

The draft RI Report's observation, indicating that a large site surface water body, the northern impoundment, serves as a primary source of recharge for the Benwood limestone water-bearing zone was erroneously excluded from the Final RI Report. As a result, the Final RI Report's discussion of limited recharge to the Benwood formation by the northern impoundment is based on improper use of site data and flawed logic.

<u>Response</u>

The Agency maintains its position that the northern impoundment is not the primary recharge source for the Benwood limestone. The above comment presented calculations which estimated the recharge potential to the Benwood from both the mine refuse at the Benwood subcrop and the northern impoundment. The calculations concluded that the northern impoundment may have 2 to 5 times the recharge potential of the subcrop. These calculations, however fail to take into account the sediments at the bottom of the northern impoundment, which should reduce discharge from the impoundment. In the concluding statement of the final RI Report, the Agency did not discount the northern impoundment as a recharge source, only that it is not the major recharge source.

20. Comment

The Final RI Report (p. 211) notes that NW-10C and MW-3B could not be properly developed because of exceptionally low yields. Despite these deficiencies, the agencies required that data from these wells be used in the endangerment assessment (Final EA Report, p.2-9) in calculating potential human exposure to ground water. It is never necessary or proper to use data when there is strong reason to suspect that the data is spurious. In both instances, other wells in the same formation are available to provide adequate information to establish the true water quality of those zones (Final RI Report, p. 211). The required use of data form undeveloped wells is contrary to numerous EPA guidance on ground water monitoring. It is unacceptable to use spurious data by claiming that its use is a conservative assumption. The data is invalid and meaningless. Moreover, the data cannot be considered valid, meaningful, or "conservative" simply because similar "numbers" are obtained from valid data.

Response

The Agency maintains its position that analytical data from these wells is valid. The data from these wells was validated through laboratory and Agency QA/QC procedures. In this instance, the Agency stated that inclusion of the data was a "conservative approach", not in terms of estimating the health risks posed by the site, but in terms of the uncertainty of the source of contaminants detected in the well. The Agency was not convinced that the chemicals of concern present in the sample were derived merely from well installation problems, therefore the data from these wells was included in the endangerment assessment.

21. Comment

The Final Endangerment Assessment (EA) Report assumes an unreasonable future residential use scenario where local streams are used as a primary drinking water source, even though ingestion of surface waster is "not expected to be a major or probable exposure route" (Final EA Report, p. 3-28), and "ingestion of untreated surface water probably constitutes the least likely exposure pathway due to the poor aesthetic quality of the stream water (i.e, discoloration and palatability effects due to acid mine drainage conditions", Final EA Report, p. 5-16). Risks calculated under this scenario provide an inappropriate and misleading characterization of BRL site-related risks.

Response

The Agency determined that calculating future residential risks for ingestion of surface water (as a primary drinking water source) in this area was justified. During the residential survey, wells which were installed into the alluvial aquifer adjacent to Little McMahon Creek were identified. There is a possibility that the water entering these wells is coming directly from Little McMahon Creek. Another consideration under the future use scenario was that, because water bearing zones under the site do not produce large amounts of water, surface water may be the only viable source of water in an on-site residential scenario.

22. Comment

The Endangerment Assessment (EA) attempted to examine "the potential health and environmental effects which may be associated with contaminants in the environmental media at the Buckeye Reclamation Landfill." Final EA Report, Executive Summary. The EA is based on the analytical results of samples collected during the RI. The results of such an assessment can only be meaningful if the analytical methods used are sensitive enough to accurately determine the levels of contaminants present in the samples being analyzed. The analytical methods used in the RI were selected based on what was understood to be the exposure pathways that would be considered in the EA, and the sensitivity of the selected methods provided results that can be used to characterize the risk of those pathways. For example, for dermal exposure the analytical results allowed for an accurate calculation of risk and indicated that the total pathway hazard indices and cancer risks from dermal contact with surface water were well within the acceptable range. The selected analytical methods, however were not sensitive enough to properly characterize the risk created by a surface water ingestion scenario.

Analytical methods with very low limits of detection were not used because exposure through surface water ingestion was not considered to be a realistic or even proper exposure scenario. As a result, the analytical methods used do not provide the low detection limits that are needed to properly characterize risk associated with a water ingestion scenario. Despite the lack of appropriate analytical sensitivity, the Final EA Report added a surface water exposure pathway and assumed that each <u>non-detected</u> contaminant was present at its analytical detection limit. Thus, all samples were assumed to have contaminants present at least at the analytical level of detection.

This fundamentally flaws the EA process because the minimum detection levels for the analytical methods used, the lowest level possible under the assumptions used in the Final EA

Report, present unacceptable risks.

Response

Data used in the calculation of risk in the EA was first screened using several criteria. One of the first requirements for a contaminant to be considered present in a media was that it was detected, either at estimated or above detection limit concentrations. If a chemical was not detected in a certain media, risks were not calculated for that chemical in that media. If a contaminant was detected at one sampling point in a specific media, it was considered to be present throughout the media, at the detection limit. The guidance under which this document was prepared, the Superfund Public Health Evaluation Manual (SPHEM), allows latitude in selecting one-half or full detection limits for performing calculations. The Agency chose to use the full detection limit for EA calculations because a conservative approach was desired and this option was available in the Agency guidance. If a contaminant is present in a media and that media provides a complete exposure pathway, the Agency must estimate the risks associated with the pathway.

23. Comment

Calculation of risk in the Final EA Report employs methodologies that pool data from several surface water sampling stations to derive mean contaminant concentrations for use in exposure calculations. The way in which the data from the surface water stations was pooled resulted in groupings of data that make it impossible to meaningfully compare the risk caused by landfilling activities with the risk created by acid mine drainage ("AMD") from the mine refuse at the site or in the surrounding area.

Response

The groupings of the surface water data used to derive the mean contaminant concentrations were developed jointly by the site steering committee and the Agency. At the time, all parties agreed that this grouping would best assess the health effects posed by the site. A major issue discussed was how applicable the Unnamed Run surface water station (BY-6) data was for BRL site comparisons. The Unnamed Run is not impacted by landfilling but is greatly impacted by acid mine drainage (AMD). Because Unnamed Run is in a different drainage basin in which there has been no reclamation activity similar to that which has occurred in the Kings Run Basin, the Agency determined that any risks calculated using only Unnamed Run data would overstate site related AMD effects. For this reason, the Agency determined the data groupings used in the Final EA best assessed site risks.

24. Comment

The use of storm water flow data in deriving mean contaminants concentrations for use in exposure modeling is improper and unrealistic. By Combining two rounds of storm water data with baseflow data in the calculation of mean contaminant concentrations, the results of the Final EA Report are inappropriately slanted toward storm conditions. Baseflow conditions are more typically present in the stream. Storm water flow in these streams is a brief, rare event. Using both sets of the data causes the exposure scenario to effectively model a situation where a major storm event occurs half of the time. Giving equal weight to both sets of data results in a mean calculation that is inappropriate and not representative of site conditions.

When calculations in the Final EA Report are recalculated with only baseflow data included, Hazards and risks are greater in the Pre-landfill condition than at the BRL site.

Response

The Agency insisted on collection of storm flow surface water samples in order to evaluate potential maximum contaminant releases in this pathway. Analytical data from these storm flow samples did show higher contaminant levels than those found in base flow samples. The above comment and appendix to the comment proposes to ignore the data and only include base flow data in calculating risks from this pathway. The Agency determined the two sets of data should be combined in order to fully evaluate risks posed by the pathway.

25. Comment

The draft RI Report provided important observations related to the potential for the BRL site to impact local streams by noting that BRL site-related contaminants in surface water are the same metal contaminants, and in similar concentrations as found in the AMD. It is altogether reasonable and proper to contrast potential future impacts form all sources of contamination in discussing the likelihood that the alluvial aquifer will be impacted by the BRL site in the future.

The draft RI Report (p. 407) also noted the elevated concentrations of metals from mine spoil leachate in the Unnamed Run drainage have been acting on this aquifer for over 60 years, yet no MCLs for these contaminants were exceeded in domestic well samples. There were very few occurrences of volatile or semivolatile contaminants detected in surface waters recharging this aquifer and values for contaminants that were detected were at or near detection limits. In addition, the highly mobile organic contaminants that could conceivably be coming from the Waste Pit have not been detected in surface water and are in low concentrations in on-site ground water. Semivolatile compounds were not

7.6

selected by the Agency for the dust generation model, were too conservative or unrealistic. The Agency carefully reviewed the draft EA Report. It contained parameters which were determined, by the Agency, to be either incorrect or not conservative enough. Parameter values recommended by the Agency were then taken from guidance (Compilation of Air Pollutant Emission Factors: Volume 1: Stationary Point and Area Sources. AP-42, 4th Edition, U.S. EPA, September, 1985 and Superfund Exposure Assessment Manual. EPA/540/1-88/001, OSWER Directive 9285.5-1. April, 1988) after the Agency had considered site conditions, and examined parameters which best fit site conditions and the model which was being used. The Agency maintains that all assumptions best represented site conditions and best suited the model used for the calculations.

27. Comment

Ambient air samples were collected during the remedial investigation (Final RI Report, Section 6.0). Air sampling data indicated there was no risk to human health because the concentrations detected were more than a thousand times less than the pertinent health based standard, the OSHA PEL. At the time of the air sampling, the samples collected in the Waste Pit area were collected directly downwind of the active landfill area and the most-widely used haul road. The sampling areas were approximately 100 to 900 feet down wind of the active landfill and the haul road, and so the locations of samples are reasonably consistent with a 100-yard distance from the source used in the Model (one sample is closer, the other more distant). Therefore, the Model can be used to calculate risk at the sampling locations, with the garbage hauling vehicles on the haul road considered as the source of dust. These calculations can then be compared to risk calculated using actual air sampling data obtained at the site to calibrate the Model. Comparing the exposure risk calculated from actual chromium air sampling data with risk arrived at by using the model, shows two orders of magnitude difference in risk. That is, the Agencies variables result in a risk that is 100 times more severe than the risk indicated by actual data.

Response

The Agency finds the difference in the risks determined from the two methods referred to in the above comment acceptable. Data collected during air sampling at the site likely represents typical conditions at the site. The risk calculations for inhalation of fugitive dust attempted to estimate the worst case conditions, which were not present on site while the air sampling was being conducted. The results given in the above comment conclude essentially that worst case risks are approximately two orders of magnitude greater than average conditions.

4. Remaining Concerns

Issues and concerns that the Agency was unable to address during remedial planning activities include the following:

* Effectiveness of Constructed Wetlands Treatment.

  The Agency plans to conduct a pilot-scale treatability study during remedial design to further evaluate the effectiveness of the wetlands treatment system. A bench-scale treatability study is being completed and preliminary indications for effectiveness of contaminant removal are favorable.

* Hydrogeologic Data Gaps.

  In order to design the leachate and ground water collection system for this site, additional hydrogeologic studies will need to be performed during the remedial design.

FINAL

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	1	00/00/00	Letter forwarding a corrected copy of the Consent Order	R.Field,USEPA	D.Graham,Freedman, et.al.	Correspondence	1
	1	00/00/00	Letter forwarding a copy of the RAMP for Buckeye Reclamation	P.Miller,USEPA	W.Olasin,Envir. Manager	Correspondence	2
	1	78/06/01	Letter re: The analysis of the "Tramp Oil Mixture"	D.Menza,Blair Chemical Laboratories	P.Mitchell,SIF Industries	Correspondence	3
	1	79/02/12	Letter re: An analysis of the residue that is being hauled to Buckeye	R.McClure,Admin. Services Manager	R.Mays,Mays Corp.	Correspondence	4
	1	79/03/09	Letter re: A breakdown of the average amount of residue per month		R.Mays,Mays Disposal Corp	Correspondence	5
	3	79/06/19	Letter re: Belmont County Buckeye Reclamation Solid Waste - Site Inspection	S.Hamlin,OEPA	T.Dieringer,Buckeye Rec.	Correspondence	6
	13	80/08/14	Letter re: Belmont County Solid Waste Disposal Survey with other relevant letters attached	M.Koschell,OEPA	M.Kirkland,Health Commiss	Correspondence	7
	2	80/09/26	Letter re: Discussion of the condition at the Belmont County Landfill as outlined in the Aug. 14, 1980 letter from OEPA	J.Carnes,Cravat Coal Co.	D.Pickenpaugh,BCBH	Correspondence	8
	7	80/12/04	Letter re: Belmont County Solid Waste Survey and eyewitness accounts of sludge disposal	R.Marshall,OEPA	M.Kirkland,BCBH	Correspondence	9
	15	81/01/05	Letter re: Responses made by PRPs concerning the disposal of waste	PRPs	Marshall & Koschell,OEPA	Correspondence	10

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			at the BRL site				
	1	81/01/05	Letter re: Response to OEPA for information on waste disposal at the BRL site, with a list presented	J.Moniot,United States Steel Corp.	R.Marshall,OEPA	Correspondence	11
	1	81/01/16	Letter re: Samples taken on Oct. 15,1980 of the orange sludge from Triangle PVC, dumped at Buckeye have shown the waste to be toxic	R.Marshall,OEPA	M.Kirkland,BCHD	Correspondence	12
	2	83/02/07	Letter re: Ashland's response to OEPA's request for information concerning disposal of waste at Buckeye	R.Sterrett,Ashland Chem Co.	M.Moschell,OEPA	Correspondence	13
	4	83/03/10	Letter re: USS's response to OEPA's request for information regarding disposal of sludges and other wastes	D.Vanfossen,USS	M.Moschell,OEPA	Correspondence	14
	24	83/03/21	A packet of letters regarding Belmont County Solid Waste Survey from OEPA to the ~~Belmont~~ Belmont County Board of Health and Matt Kirkland, the Health Commissioner	M.Moschell,OEPA	M.Kirkland,Health Commiss	Correspondence	15
	70	83/10/19	Copies of contracts between Buckeye Reclamation Landfill and Belmont County Commissioners with memo attached	M.Moschell,OEPA	B.Pfefferle,OEPA	Correspondence	16
	2	83/10/20	Letter re: BRL has been listed as a hazardous waste Superfund site and the landfill should not be expanded into the Phase II area until the	M.Bibiser,OEPA	T.Bieringer,Cravat Coal	Correspondence	17

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			RI/FS is completed				
	9	84/01/06	Letter re: Ohio EPA has completed the review of the draft RAMP for Buckeye Reclamation with comments included	M.Besel,OEPA	T.Rutter,USEPA	Correspondence	18
	1	84/09/07	Letter forwarding a copy of the Buckeye Reclamation Landfill RAMP	P.Miller,USEPA	A.Sargus,Commissioner	Correspondence	19
	3	84/09/21	Solid Waste Disposal Facility Violation Notice with cover letter attached	M.Rihiser,OEPA	R.Warner,BC Health Dept.	Correspondence	20
	2	84/10/22	Letter of Notification: This letter notifies State Clearinghouse of the BRL Superfund site to be funded by the USEPA	B.Constantelos,USEPA	J.Bachman,Administrator	Correspondence	21
	2	84/11/14	Letter re: State Clearinghouse Intergovernmental Review-Notice of Receipt	L.Wise,State Clearinghouse PC	B.Constantelos,USEPA	Correspondence	22
	6	84/12/07	NOTICE LETTER re: USEPA is currently planning to conduct Feasibility studies to evaluate possible remedial actions to remove or contain hazardous substances	B.Constantelos,USEPA	Cravat Coal Company	Correspondence	23
	2	84/12/19	Letter re: OEPA agrees that investigations and studies for the BRL site should be initiated as soon as possible	R.Maynard,OEPA	V.Adamkus,USEPA	Correspondence	24
	2	84/12/28	Letter re: State Clearinghouse Intergovernmental Review	L.Roberts,State Clearinghouse	B.Constantelos,USEPA	Correspondence	25
	1	85/01/31	Letter forwarding copies	T.Sivak,Koppers	M.Berman,USEPA	Correspondence	26

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			of all shipping documents in Koppers' possession relating to the transportation and disposal of hazardous wastes at the Buckeye Reclamation Landfill				
	6	85/06/14	NOTICE LETTER re: USEPA has information that indicates that J.M.Wagner & Sons may be a responsible party	B.Constantelos,USEPA	J.M.Wagner & Sons	Correspondence	27
	2	85/08/30	Letter re: To formalize an investigative phase of the waste pit boring's analytical protocol discussed in a phone conversation on 8/29/85	D.Bicknell,USEPA	E.Crumrine,Versar Inc.	Correspondence	28
	25	85/09/10	Letter forwarding excerpts from OEPA files regarding the Buckeye Reclamation Landfill; the general site information is taken from the Final RAMP dated April 27, 1984	M.Sanbro,OEPA	M.Berman,USEPA	Correspondence	29
	1	85/11/12	Letter re: Belmont County Memorial Park Association	J.Costine,Costine & Costine	M.McCue,USEPA	Correspondence	30
	2	85/12/00	Letter forwarding a copy of the Community Relations Plan for the BRL site	M.McCue,USEPA	A.Sargus,Bel.C Commission	Correspondence	31
	1	85/12/02	Letter re: RI public comment	M.James	M.McCue,USEPA	Correspondence	32
	1	85/12/10	Letter forwarding a comment letter sent to USEPA following the RI/FS public meeting	D.Bicknell,USEPA	M.Moschell,OEPA	Correspondence	33
	2	86/01/00	Response to Public Comment BRL January	USEPA		Correspondence	34

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			1986				
	6	86/01/21	Letter forwarding a copy of USEPA's and OEPA's responses to the public comments received regarding the consent order to investigate the BRL site	M.McCue,USEPA	Parkhurst.Zarvatski, James	Correspondence	35
	1	86/01/23	Letter re: Buckeye Reclamation Administrative Order by Consent	M.Berman,USEPA	D.Graham,Freedman.et .al.	Correspondence	36
	3	86/02/05	Letter re: Private Well Complaint Belmont County Buckeye Rec. CERCLA	M.Preston,OEPA	J.Zarvatski	Correspondence	37
	4	86/03/21	Letter re: Invitation to a meeting with USEPA and OEPA requested by Belmont County Commissioners and the Citizens for Landfill Safety	A.Gasior,USEPA	BCC,BCHD,BCCOC & CLSC	Correspondence	38
	1	86/03/24	Letter re: This letter will serve as the BRLSC's first progress report	D.Graham,Freedman,et.al.	M.Berman,USEPA	Correspondence	39
	12	86/05/28	Letter re: QAO has received the Buckeye Reclamation Committee's submittal and determined the QAPP of the document to be unapprovable due to insufficient detail with sample location sheet attached	D.Bicknell,USEPA & M.Zumbro,OEPA	W.Olasin,BRLSC-PC	Correspondence	40
	16	86/06/16	Letter re: Agencies' comments on the Buckeye Reclamation Committee's submittal pursuant to the AO by Consent titled "Operations Plan for RI/FS" with attachments 1-3 enclosed	D.Graham,Freedman,et.al.	M.Berman,USEPA	Correspondence	41
	2	86/07/00	Letter re: The corrected	Versar Inc.	Area Residents	Correspondence	42

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			Door-to-Door Survey Introduction Letter, with the questionnaire attached				
	5	86/07/08	Letter re: Buckeye Reclamation Landfill Reconnaissance Survey of Domestic Wells	J.Richards,Versar Inc.	D.Bicknell,USEPA	Correspondence	43
	4	86/07/21	Letter forwarding the original letter, with USEPA comments, that will be distributed door-to-door by the contractor, Versar Inc., to determine who is on groundwater about the BRL site	D.Bicknell,USEPA	W.Olasin	Correspondence	44
	1	86/07/25	Letter re: BRL Reconnaissance Survey of Domestic Wells	J.Richards,Versar Inc.	D.Bicknell,USEPA	Correspondence	45
	1	86/08/04	Letter re: Approval of the 'Letter of Introduction' for the door-to-door survey by the USEPA and OEPA	D.Bicknell,USEPA & M.Zumbro,OEPA	W.Olasin,BRLSC-PC	Correspondence	46
	10	86/08/18	Letter re: Comments to the June 24, 1986 BRLSC's re-submittal titled "Site Management Plan for the Performance of the RI/FS Project at the BRL site"	D.Bicknell,USEPA & M.Zumbro,OEPA	W.Olasin	Correspondence	47
	1	86/09/02	Letter forwarding a figure detailing the location of newly identified active leachate seeps at the BRL site	D.Bicknell,USEPA	M.Zumbro,OEPA	Correspondence	48
	1	86/10/07	Letter re: This letter is to inform you of the laboratory results obtained from the July 31, 1986 sampling of	D.Bicknell,USEPA	W.McCormick	Correspondence	49

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			your drinking water by the USEPA				
	1	86/11/19	Letter forwarding a photographic log of the Aug. 14, 1986 site survey at the BRL NPL site	D.Bicknell,USEPA	M.Moschell,OEPA	Correspondence	50
	1	86/11/21	Letter re: Receipt of letter dated Nov. 19, 1986 and request for an extension on the revisions to the Site Management Plan,QAPP, and Health & Safety Plan for the RI/FS	W.Olasin,BRLSC-PC	D.Bicknell,USEPA	Correspondence	51
	1	86/12/01	Letter re: Request granted for an extension in the re-submittal of the Site Management Plan, QAPP, and Health & Safety Plan	D.Bicknell,USEPA	W.Olasin	Correspondence	52
	6	86/12/02	Letter forwarding a copy of the notice letter sent to National Steel Corporation and Shenango, Inc. and copy of notice letter	M.Berman,USEPA	D.Graham,Freedman,et .al.	Correspondence	53
	3	86/12/03	Letter re: The changes that have been made to the Site Management Plan and QAPP for the performance of an RI/FS at the Buckeye Reclamation Landfill	W.Olasin,BRLSC-PC	D.Bicknell,USEPA	Correspondence	54
	1	87/01/07	Letter forwarding copies of ion chromatograms obtained during the course of developing the methods for analysis of the organic acids in water and soil/sludge samples	W.Olasin,BRLSC-PC	D.Bicknell,USEPA	Correspondence	55

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	3	87/01/29	Letter re: USEPA and OEPA reviewed the QAPP and the changes for approval are listed	D.Bicknell,USEPA & M.Moschell,OEPA	W.Olasin,BRLSC-PC	Correspondence	56
	13	87/02/13	Letter re: Revisions of the Site Management Plan, the QAPP, and the Health and Safety Plan for Buckeye Reclamation by the USEPA and OEPA	D.Bicknell,USEPA & M.Moschell,OEPA	W.Olasin,BRLSC-PC	Correspondence	57
	3	87/02/17	Letter re: Revisions to the QAPP with a replacement page list attached	W.Olasin,BRLSC-PC Ohio Resources Corp.	D.Bicknell,USEPA	Correspondence	58
	5	87/03/17	Letter re: The USEPA-QAO has reviewed the data and determined the information insufficient to demonstrate the propriety of using the described carboxylic acid methodology with the memorandum enclosed	D.Bicknell,USEPA	W.Olasin	Correspondence	59
	3	87/04/10	Letter re: Results of additional tests of the carboxylic acid methodology	W.Olasin,BRLSC-PC Ohio Resources Corp.	D.Bicknell,USEPA	Correspondence	60
	1	87/05/19	Letter re: USEPA and OEPA will approve the QAPP with modifications after the review of the PRP data submitted on 4/10/87	D.Bicknell,USEPA & M.Moschell,OEPA	W.Olasin & D.Graham	Correspondence	61
	19	87/06/05	Letter forwarding a brief summary of Section 121 , with a memo from J. Porter, Assistant Administrator for Solid Waste and Emergency Response on Interim Guidance on Superfund Selection of remedy .	D.Constantelos,USEPA	W.Olasin	Correspondence	62

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	15	87/08/07	Letter re: Proposed Sampling in an Alleged Disposal Area	W.Bradford,Versar Inc.	D.Bicknell,USEPA	Correspondence	63
	2	87/08/11	Letter re: The monthly progress report for June, 1987 from BRLSC, has a number of points which warrant comment by the USEPA and OEPA	D.Bicknell,USEPA	D.Graham,BRLSC-Chairman	Correspondence	64
	5	87/08/20	Letter re: As part of the Consent Order, it was agreed that the USEPA and OEPA would oversee, review, and approve the PRPs implementation and production of the work required by the Consent Order with concerns listed	E.Tindall,USEPA & M.Moschell,OEPA	W.Olasin,BRL PRP-PC	Correspondence	65
	8	87/08/21	Letter re: Follow up to our conference call of 8/4/87 concerning the progress of activities at the BRL site	D.Graham,Freedman,Levy, et.al.	D.Bicknell,USEPA	Correspondence	66
	12	87/08/21	Letter re: Problems with Air Coring and Selection of Other Drilling Fluids, with letter dated 8/10/87 regarding the Well Project attached	W.Olasin,BRLSC-PC Cravat Coal Co.	E.Tindall,USEPA	Correspondence	67
	3	87/08/21	Letter re: Modification to Procedures for Installing Deep Upper-Zone Wells	W.Olasin,BRLSC-PC Cravat Coal Co.	E.Tindall,USEPA	Correspondence	68
	2	87/08/26	Letter re: The monthly progress report for July, 1987 from BRLSC, has a number of points which warrant comment by the USEPA and OEPA	E.Tindall,USEPA & M.Moschell,OEPA	W.Olasin,BRL PRP-PC	Correspondence	69
	10	87/09/22	Letter re: Stratigraphic	W.Olasin,BRLSC-PC	E.Tindall,USEPA	Correspondence	70

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	2	88/01/13	Letter re: The monthly progress report for November 1987 from the BRLSC, has a number of points that warrant comment by the USEPA and OEPA	L.Marsh,OEPA & K.Tindall,USEPA	W.Olasin,BRL PRP-PM	Correspondence	78
	19	88/01/18	Letter forwarding copies of letters sent to individuals listed in the USEPA letter dated Oct. 13, 1987, regarding future sampling of domestic wells and springs in the vicinity of the BRL	W.Bradford,Versar Inc.	Tindall,USEPA Marsh,OEPA	Correspondence	79
	10	88/01/19	Letter re: Alternative Method for Flow-Proportional Sampling	W.Olasin,BRLSC-PC Cravat Coal Co.	Tindall,USEPA & Moschell	Correspondence	80
	6	88/01/19	Letter re: Response to Agency letter regarding the October 1987 Technical Progress Report and the 11/17/87 conference call	W.Olasin,BRLSC-PC Cravat Coal Co.	Tindall,USEPA Marsh,OEPA	Correspondence	81
	1	88/01/27	Letter re: The USEPA and OEPA have reviewed and approved the well locations and methods	L.Marsh,OEPA & K.Tindall,USEPA	W.Olasin,BRL PRP-PM	Correspondence	82
	2	88/02/01	Letter re: The December, 1987, Monthly Progress Report from BRLSC concerning the technical RI/FS activities, has a number of points which warrant comment by the USEPA and OEPA	K.Tindall,USEPA & L.Marsh,OEPA	W.Olasin,BRL PRP-PM	Correspondence	83
	4	88/02/12	Letter re: Proposed Procedures for Field Filtration of Ground-Water Samples	W.Olasin,BRLSC	Tindall,USEPA Marsh,OEPA	Correspondence	84

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	4	88/02/22	Letter forwarding OEPA comments on Technical Memorandum submitted as of 1/29/88	L.Marsh,OEPA	K.Tindall,USEPA	Correspondence	85
	1	88/02/24	Letter re: The USEPA and OEPA have received and reviewed the submittal entitled "Questionable Feasibility and Utility of a Seismic Refraction Survey" dated Dec. 28, 1987	L.Marsh,OEPA & K.Tindall,USEPA	W.Olasin,BRL PRP-PM	Correspondence	86
	46	88/02/25	Letter re: Overview of Contaminant Occurrence and Recommendation for Discontinuation from Future Analyses	W.Olasin,BRLSC-PC Cravat Coal Co.	Tindall,USEPA Marsh,OEPA	Correspondence	87
	1	88/03/01	Letter re: The USEPA and OEPA have recieved and reviewed the submittal titled "Proposed Procedures for Field Filtration of Ground-Water Samples" dated Feb. 12, 1988	L.Marsh,OEPA & K.Tindall,USEPA	W.Olasin,BRL PRP-PM	Correspondence	88
	1	88/03/10	Letter re: The USEPA and OEPA have received and reviewed the submittal titled "Alternative Method for Flow-Proportional Sampling" dated 1/19/88	K.Tindall,USEPA & L.Marsh,OEPA	W.Olasin,BRL PRP-PM	Correspondence	89
	2	88/03/29	Letter re: The USEPA and OEPA received and reviewed the submittal titled "Proposed Procedures for Field Filtration of Ground-Water Samples" dated February 12,1988	L.Marsh,OEPA & K.Tindall,USEPA	W.Olasin,BRL PRP-PM	Correspondence	90
	1	88/04/08	Letter re: The USEPA	L.Marsh,OEPA & K.	W.Olasin,BRL PRP-PM	Correspondence	91

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	1	88/05/09	Letter re: CRL review and comments on the BRL site sample raw data	K.Tindall,USEPA & L.Marsh,OEPA	W.Olasin,BRL PRP-PM	Correspondence	93
	2	88/05/09	Letter re: The monthly progress report for March,1988 for Buckeye has a number of points which warrant comment by the USEPA and OEPA	K.Tindall,USEPA & L.Marsh,OEPA	W.Olasin,BRL PRP-PM	Correspondence	94
	3	88/05/10	Letter re: The QAO and the Overview of Contaminant Occurrence and Recommendation for Discontinuation from Future Analysis have been reviewed and the comments are being forwarded	K.Tindall,USEPA & L.Marsh,OEPA	W.Olasin,BRL PRP-PM	Correspondence	95
	13	88/05/11	Letter re: Buckeye Reclamation Landfill RI/FS Assessment of Progress on Stream Ratings	W.Bradford,Versar Inc.	L.Marsh,Ph.D.,OEPA	Correspondence	96
	7	88/05/12	Letter forwarding copies of the draft summary data and QA/QC packages for review	W.Bradford,Versar Inc.	K.Tindall,USEPA	Correspondence	97
	7	88/05/19	Letter re: BRL RI/FS Second Overview of Contaminant Occurrence and Recommendation for	W.Olasin,BRLSC-PC Cravat Coal Co.	Tindall,USEPA Marsh,OEPA	Correspondence	98

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	2	88/06/17	Letter forwarding a copy of the draft preliminary report entitled "Well Installation and Hydrogeologic Evaluation"	W.Olasin,BRLSC-PC Cravat Coal Co.	Tindall,USEPA Marsh,OEPA	Correspondence	101
	2	88/06/27	Letter re: Comments on the April and May,1988 Progress Reports from BRLSC concerning the technical RI/FS activities being conducted at the Buckeye Reclamation Landfill	K.Tindall,USEPA	W.Olasin,Buckeye PRP-PM	Correspondence	102
	2	88/06/29	Letter re: USEPA and OEPA resolves the dispute in the sampling procedures for storm flow surface water events and provides a mutually acceptable procedure for collecting flow proportional samples	K.Tindall,USEPA & L.Marsh,OEPA	W.Olasin,BRL PRP-PM	Correspondence	103
	2	88/07/14	Letter re: BRL RI/FS Conference Call of July 7, 1988	W.Olasin,BRLSC-PC Cravat Coal Co.	Tindall,USEPA Marsh,OEPA	Correspondence	104
	21	88/07/26	Letter re: BRL RI/FS Leachate Sampling	W.Olasin,BRLSC-PC Cravat Coal Co.	Tindall,USEPA Marsh,OEPA	Correspondence	105

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	1	88/09/02	Letter re: USEPA and OEPA propose that the first storm event surface water sampling be conducted as specified in the BRL QAPP	L.Marsh,OEPA & K. Tindall,USEPA	W.Olasin,BRL PRP-PM	Correspondence	106
	1	88/09/13	Letter re: USEPA and OEPA have determined that the December leachate sampling event data does meet the objectives of the Buckeye QAPP and will be included in the RI report	K.Tindall,USEPA & L.Marsh,OEPA	W.Olasin,BRL PRP-PC	Correspondence	107
	1	88/09/23	Letter forwarding a copy of the draft preliminary report entitled "Aquifer Testing Investigation"	W.Olasin,BRLSC-PC	Tindall,USEPA Marsh,OEPA	Correspondence	108
	2	88/09/27	Letter re: Acceptance of proposed modification of the Buckeye QAPP	D.Graham,Chairman-BRLSC	Tindall,USEPA Marsh,OEPA	Correspondence	109
	3	88/10/18	Letter re: BRL RI/FS Third Overview of Contaminant Occurrence and Recommendation for Discontinuation from Future Analyses	W.Olasin,BRLSC-PC Versar Inc.	Tindall,USEPA Marsh,OEPA	Correspondence	110
	2	88/11/01	Letter re: USEPA and OEPA have reviewed the "Third Overview of Contaminant Occurrence and Recommendation for Discontinuation from Future Analyses" proposal and related data	L.Marsh,OEPA & K. Tindall,USEPA	W.Olasin,BRL-PM	Correspondence	111
	1	88/12/29	Letter forwarding a copy of the draft preliminary report entitled "Springs	W.Olasin,BRLSC-PC	Tindall,USEPA Marsh,OEPA	Correspondence	112

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	2	89/01/26	Letter re: Comments made by the USEPA and OEPA on the draft report entitled "Report on Electromagnetic Induction Survey"	K.Tindall,USEPA & L.Marsh,OEPA	W.Olasin,BRL-PM	Correspondence	114
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	3	89/01/26	Letter re: Comments made by the USEPA and OEPA on the draft preliminary report titled "Well Installation and Hydrogeologic Evaluation"	K.Tindall,USEPA & L.Marsh,OEPA	W.Olasin,BRL-PM	Correspondence	116
	2	89/01/31	Letter re: Comments made by the USEPA and OEPA on the draft report entitled "Preliminary Report, Leachate Investigation"	K.Tindall,USEPA & L.Marsh,OEPA	W.Olasin,BRL-PM	Correspondence	117
	3	89/05/11	Letter forwarding OEPA comments on the Buckeye RI report	L.Marsh,OEPA	K.Tindall,USEPA	Correspondence	118
	6	89/05/30	Letter re: Review of RI Report for BRL	J.Yoshitani & J.Morrison,CDM	Rush & Tindall,USEPA	Correspondence	119
	12	89/06/02	Letter forwarding the USEPA and OEPA comments on the BRL Site draft	K.Tindall,USEPA & L.Marsh,OEPA	W.Olasin,BRL-PM	Correspondence	120

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	8	89/06/30	Letter re: A list of State ARARs for the Buckeye Reclamation Site are enclosed	B.Blair,OEPA	K.Tindall,USEPA	Correspondence	122
	32	89/07/03	Letter forwarding joint agency comments on the draft preliminary scoping of potential remedial actions and as amended (AAM), USEPA ARARs and OEPA ARARs	K.Tindall,USEPA & B.Blair,OEPA	W.Olasin,BRL-PM	Correspondence	123
	17	89/07/12	Letter forwarding the amended Alternatives Array Matrix (AAM)	K.Tindall,USEPA	W.Olasin,BRL-PM	Correspondence	124
	29	89/07/31	Letter forwarding M&E's review comments on the BRL Preliminary Draft Endangerment Assessment	A.Tyler,Metcalf & Eddy	K.Tindall,USEPA	Correspondence	125
	3	89/08/21	Letter re: U.S.EPA and OEPA have received and reviewed the Buckeye draft EA and FS and found documents tech-nically inadequate and the EA revealed major deficiencies and as a result the report is disapproved	M.Gade,USEPA	D.Graham,Chairman BRLSC	Correspondence	126
	5	89/10/24	Letter re: Buckeye Reclamation Landfill Final RI Report	K.Tindall,USEPA & A.Lavelle,OEPA	W.Olasin,BRL-Project Mngr	Correspondence	127
	3	89/11/06	Letter re: Buckeye Reclamation-Discussion of Comments on the Risk Assessment and Agreement on the Scope of Work for	M.Raimonde,M&E	K.Tindall,USEPA	Correspondence	128

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	5	90/01/25	Letter re: U.S.EPA review comments on the revised EA for Buckeye Reclamation Landfill Site	K.Tindall,USEPA	M.Raimonde,BRL Site Mngr.	Correspondence	130
	4	90/01/29	Letter re: OEPA's comments on the Buckeye Reclamation Landfill, M&E revised Draft EA	A.Lavelle,OEPA	K.Tindall,USEPA	Correspondence	131
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	10	90/06/20	Letter re: OEPA's comments on the Buckeye Reclamation Landfill, M&E revised FS	A.Lavelle,OEPA	K.Tindall,USEPA	Correspondence	133
	7	90/06/23	Letter re: U.S.EPA's comments on the Buckeye FS	K.Tindall,USEPA	M.Raimonde,BRL Site Mngr.	Correspondence	134
	2	90/06/29	Letter forwarding pages to the Buckeye Reclamation RI report which have been amended by the U.S.EPA and OEPA	K.Tindall,USEPA & A.Lavelle,OEPA	D.Graham,BRL Steering Com	Correspondence	135
	1	90/07/25	Letter re: Extension for Response to Buckeye Reclamation Landfill Endangerment Assessment and Feasibility Study Comments	K.Tindall,USEPA	D.Graham,BRL-Steering Com	Correspondence	136
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	1	82/06/22	Memo re: The plans, as approved, included a provision for the installation of a drainage culvert	D.Aukland,OEPA	D.Day,OEPA	Memorandum	142
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	5	86/12/31	Memo re: Review of QAPP for the RI/FS at the Buckeye Reclamation Landfill Site,Ohio with trans mittal attached	J.Adams,Jr.USEPA	B.Niedregang,USEPA	Memorandum	147
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	24	88/05/00	Revised Work Plan for PRP/RI/FS Oversight at Buckeye Reclamation Landfill Belmont County,Ohio	Jacobs Engineering Group, Inc.	EPA-Region V	Reports/Studies	214
	9	88/05/10	Buckeye Reclamation Landfill April,1988 Progress Report	W.Olasin,BRLSC-PM Cravat Coal Co.	Tindall,USEPA Marsh,OEPA	Reports/Studies	215
	9	88/06/10	Buckeye Reclamation Landfill May,1988 Progress Report	W.Olasin,BRLSC-PM Cravat Coal Co.	Tindall,USEPA Marsh,OEPA	Reports/Studies	216
	8	88/07/07	Buckeye Reclamation Landfill June,1988 Progress Report	W.Olasin,BRLSC-PM Cravat Coal Co.	Tindall,USEPA Marsh,OEPA	Reports/Studies	217
	8	88/08/02	Buckeye Reclamation Landfill July,1988 Progress Report	W.Olasin,BRLSC-PM Cravat Coal Co.	Tindall,USEPA Marsh,OEPA	Reports/Studies	218
	7	88/09/09	Buckeye Reclamation Landfill August,1988 Progress Report	W.Olasin,BRLSC-PM Cravat Coal Co.	Tindall,USEPA Marsh,OEPA	Reports/Studies	219

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	6	88/11/08	Buckeye Reclamation Landfill October,1988 Progress Report	W.Olasin,BRLSC-PM Versar,Inc.	Tindall,USEPA Marsh,OEPA	Reports/Studies	221
	6	88/12/09	Buckeye Reclamation Landfill November,1988 Progress Report	W.Olasin,BRLSC-PM Versar Inc.	Tindall,USEPA Marsh,OEPA	Reports/Studies	222
	34	89/00/00	Comments by M&E on Final RI Report for Buckeye Reclamation Landfill	Metcalf & Eddy/Versar, Inc.		Reports/Studies	223
	2	89/00/00	Technical Assistance Scope of Work Buckeye Reclamation Landfill St. Clairsville,Ohio	K.Tindall,USEPA		Reports/Studies	224
	6	89/01/10	Buckeye Reclamation Landfill December,1988 Progress Report	W.Olasin,BRLSC-PM Versar Inc.	Tindall,USEPA Marsh,OEPA	Reports/Studies	225
	4	89/02/03	Buckeye Reclamation Landfill January,1989 Progress Report	W.Olasin,BRLSC-PM Versar Inc.	Tindall,USEPA Marsh,OEPA	Reports/Studies	226
	373	89/03/00	Draft Remedial Investigation Report Appendix H-K	Versar Inc.	USEPA	Reports/Studies	227
	387	89/03/00	Draft Remedial Investigation Report Appendix L-O	Versar Inc.	USEPA	Reports/Studies	228
	418	89/03/00	Draft Remedial Investigation Report Appendix A-G	Versar Inc.	USEPA	Reports/Studies	229
	4	89/03/08	Buckeye Reclamation Landfill February,1989 Progress Report	W.Olasin,BRLSC-PM Versar Inc.	Tindall,USEPA Marsh,OEPA	Reports/Studies	230

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	3	89/05/10	Buckeye Reclamation Landfill April,1989 Progress Report	W.Olasin,BRLSC-PM Versar Inc.	Tindall,USEPA Marsh,OEPA	Reports/Studies	232
	2	89/06/09	Buckeye Reclamation Landfill May,1989 Progress Report	W.Olasin,BRLSC-PM Versar Inc.	Tindall,USEPA Marsh,OEPA	Reports/Studies	233
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	3	89/08/11	Buckeye Reclamation Landfill July,1989 Progress Report	W.Olasin,BRLSC-PM Versar Inc.	~~K.Tindall&A.Lavelle,~~ USEPA	Reports/Studies	235
	3	89/09/08	Buckeye Reclamation Landfill August,1989 Progress Report	W.Olasin,BRLSC-PM Versar Inc.	K.Tindall&A.Lavelle, USEPA	Reports/Studies	236
	3	89/10/06	Buckeye Reclamation Landfill September,1989 Progress Report	W.Olasin,BRLSC-PM Versar Inc.	K.Tindall&A.Lavelle, USEPA	Reports/Studies	237
	4	89/11/09	Buckeye Reclamation Landfill Report with letter from P.Coval attached	W.Olasin,BRLSC-PM Versar Inc.	K.Tindall&A.Lavelle, USEPA	Reports/Studies	238
	3	89/12/06	Buckeye Reclamation Landfill November,1989 Progress Report	W.Olasin,BRLSC-PM Versar Inc.	K.Tindall&A.Lavelle, USEPA	Reports/Studies	239
	2	90/00/00	Statement of Work Buckeye Reclamation Belmont County,Ohio	Weber & Tindall,USEPA		Reports/Studies	240
	3	90/01/05	Buckeye Reclamation Landfill December,1989 Progress Report	W.Olasin,BRLSC-PM Versar Inc.	K.Tindall&A.Lavelle, USEPA	Reports/Studies	241
	2	90/01/19	Letter re: Buckeye Reclamation Landfill Proposed Site Mainte-nance and Repair, and	W.Olasin,Buckeye Reclamation Landfill Steering Committee-Project Manager	K.Tindall&A.Lavelle, USEPA	Reports/Studies	242

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			Characterization of Drummed Contents	Versar Inc.			
	3	90/03/08	Buckeye Reclamation Landfill February,1990 Progress Report	W.Olasin,BRLSC-PM Versar,Inc.	Tindall,USEPA Lavelle,OEPA	Reports/Studies	243
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	4	90/06/08	Buckeye Reclamation Landfill May, 1990 Progress Report	W.Olasin,BRLSC-PM Versar,Inc.	Tindall,USEPA Lavelle,OEPA	Reports/Studies	245
	429	90/06/20	Final RI Report Task 6 of the Buckeye Reclamation Landfill RI/FS	Versar,Inc./USEPA/ OEPA	BRL Steering Committee	Reports/Studies	246
	4	90/07/09	Buckeye Reclamation Landfill June, 1990 Progress Report	W.Olasin,BRLSC-PM Versar,Inc.	Tindall,USEPA Lavelle,OEPA	Reports/Studies	247
	197	90/07/19	Final Report FS for Buckeye Reclamation Landfill	Metcalf & Eddy,Inc.	Buckeye Reclamation Ladf.	Reports/Studies	248
	369	90/07/20	Final Report Endangerment Assessment for the Buckeye Reclamation Landfill A Supplemental Task of the BRL RI	Versar,Inc./revised by Metcalf & Eddy,Inc.	BRL Steering Committee	Reports/Studies	249

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	11	00/00/00	Big Five Tunnel Pilot Wetland	E. Bates-RREL Cincinnati	K. Tindall-U.S.EPA	Reports/Studies	1
	3	00/00/00	Article titled "An "An-Natural" Technology Cleans Up Mining Waste in Colorado"	Environmental Management	K. Tindall-U.S.EPA	Reports/Studies	2
	10	89/00/00	Article from Constructed Wetlands for Wastewater Treatment Municipal, Industrial and Agricultural titled 38h "Bacteriological Tests from the Constructed Wetland of the Big Five Tunnel, Idaho Springs, Colorado" Article written by Wafa Batal, Leslie S. Laudon, Thomas R. Wildeman, & Noorhanita Mohdnoordin	D. Hammer-Lewis Publishers	K. Tindall-U.S.EPA	Reports/Studies	3
	13	89/00/00	Article from Constructed Wetlands for Wastewater Treatment Municipal, Industrial and Agricultural titled Chapter 17 "Use of Wetlands for Treatment of Environmental Problems in Mining: Non-Coal-Mining Applications" Article written by Thomas R. Wildeman & Leslie S. Laudon	D. Hammer-Lewis Publishers	K. Tindall-U.S.EPA	Reports/Studies	4

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	4	89/07/12	"Design and Construction of a Research Site for Passive Mine Drainage Treatment in Idaho Springs, Colorado" Article written by Edward A. Howard, John C. Emerick, and Thomas R. Wildeman	D. Hammer-Lewis Publishers	K. Tindall-U.S.EPA	Reports/Studies	5
	23	90/04/23	Proceedings of the 1990 Mining and Reclamation Conference and Exhibition Volume II	Wildeman, Machemer, Klusman, Cohen & Lemke	K. Tindall-U.S.EPA	Reports/Studies	6
	3	90/10/00	Article from Small Flows titled "Constructed wetlands growing throughout the U.S."	F. Schutz-National Small Flows Clearinghouse	K. Tindall-U.S.EPA	Reports/Studies	7
	372	91/00/00	Final Report Endangerment Assessment	Versar, Inc.	K. Tindall-U.S.EPA	Reports/Studies	8
	165	91/04/30	Final Feasibility Study	Versar, Inc.	K. Tindall-U.S.EPA	Reports/Studies	9

GUIDANCE DOCUMENTS INDEX - UPDATE #1
BUCKEYE RECLAMATION LANDFILL SITE
Guidance Documents are available for review at
USEPA Region V-Chicago IL

TITLE	AUTHOR	DATE
Design Manual Constructed Wetlands and Aquatic Plant Systems for Municipal Wastewater Treatment EPA/625/1-88/022	U.S.EPA/ORD/CERI	88/09/00

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			the Feasibility Study and the Proposed Plan and announces that the public comment period is extended				
	1	91/06/13	Public Notice re: U.S.EPA invites public comment on the Feasibility Study and the Proposed Plan and announces that the public comment period is extended	U.S.EPA	The Times Leader	Public Notice	7
	37	00/00/00	Comments Concerning Hydrogeologic Characterization Comments 1-7		K. Tindall-U.S.EPA, RPM	Reports/Studies	8
	46	87/07/22	Supporting Documentation Appendix C Subject: Identification and Sampling of Perched Ground Water	Versar, Inc. Moody's of Dayton, Inc. Cravat Coal Co.	W. Olasin-Cravat Coal Co.	Reports/Studies	9
	12	91/05/31	Buckeye Reclamation Landfill RI/FS Figures and Tables		K. Tindall-U.S.EPA, RPM	Reports/Studies	10
	7	91/06/05	Comments on the Proposed Plan for the cleanup of the Buckeye Reclamation Landfill	Concerned Citizens: J. Zarvatski V. Ceterelli D. Lushbery B. Kota	U.S.EPA-Region V	Reports/Studies	11

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	1	91/05/30	Public Meeting Agenda for Buckeye Reclamation Landfill Superfund Site	U.S.EPA	Public	Meeting Notes	1
	1	90/08/12	Public Notice re: U.S.EPA invites public comments on the Feasibility Study and the Proposed Plan	U.S.EPA	The Times Leader	Public Notice	2
	1	90/08/19	NOTICE OF CORRECTION Due to delays in finalizing investi-gation reports, the Public Comment period and the Public Meeting have been postponed until further notice.	U.S.EPA	The Times Leader	Public Notice	3
	1	91/05/13	Public Notice re: U.S.EPA invites public comment on the Feasibility Study and the Proposed Plan at the Public Meeting	U.S.EPA	The Intelligencer	Public Notice	4
	1	91/05/13	Public Notice re: U.S.EPA invites public comment on the Feasibility Study and the Proposed Plan at the Public Meeting	U.S.EPA	The Times Leader	Public Notice	5
	1	91/06/13	Public Notice re: U.S.EPA invites public comment on	U.S.EPA	News-Register	Public Notice	6

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	84	91/06/17	Risk and Hazard Indices Calculations Data Set Full Detection Limit Appendix A		K. Tindall-U.S.EPA, RPM	Reports/Studies	12
	84	91/06/17	Risk and Hazard Indices Calculations Data Set Half Detection Limit Appendix B		K. Tindall-U.S.EPA, RPM	Reports/Studies	13
	66	91/05/30	Public Hearing for the Buckeye Reclamation Landfill Superfund Site	Streski Reporting Service & Panel Members: G. Weber-U.S.EPA A. Lavelle-OEPA K. Tindall-U.S.EPA		Transcript	14

RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION

Site: Waste Disposal Engineering, Andover, Minnesota

Documents Reviewed

The following documents, which describe the physical characteristics of the Waste Disposal Engineering Site and which analyze the cost-effectiveness of various remedial alternatives, have been reviewed by the United States Environmental Protection Agency (U.S. EPA) and form the basis for this Record of Decision (ROD):

- Modified Appendix B, Remedial Investigation, Conestoga - Rovers & Associates Limited (CRA), January 30, 1986.
- QA/QC Data Assessment, CRA, February 1, 1986.
- QA/QC Data Assessment, Volume 11 Appendices, CRA, February 1, 1986.
- Addendum to Modified Appendix B, CRA, February 28, 1986.
- Remedial Investigation, CRA, March 31, 1986.
- Supplementary Monitoring Report, CRA, July 25, 1986.
- Pit Investigation, Summary Report, CRA, August 7, 1986.
- Supplemental Remedial Investigation Report, CRA, September 22, 1986.
- Alternatives Report, CRA, April 18, 1986.
- Detailed Analysis Report, CRA, October 9, 1986.
- Detailed Analysis Report Appendices, CRA, October 9, 1986.
- Response of SW28 Group to U.S. EPA Letter Dated May 28, 1987, CRA, July 9, 1987.
- Public comments received during the 21-day comment period, and the Responsiveness Summary.
- Summary of Remedial Alternatives Selection.

I have also considered other documents which are included in the attached index to the administrative record.

Description of Remedy

The selected remedial alternative for the Waste Disposal Engineering Site is to cover the landfill with a vented cap, to contain contaminated ground water discharges from the landfill through downgradient ground water extraction wells, to contain an area within the landfill which received hazardous waste (hereinafter referred to as the "Pit") with a slurry wall and extraction well system, to avoid usage of contaminated groundwater and reversal of the upward gradient between the lower and uppers sand aquifers through institutional controls to limit wells on and near the site, to fill-in and replace a wetland area affected by the site, to treat and dispose of extracted ground water, which is expected to be accomplished by carbon adsorption and discharge to Coon Creek, and to monitor the site. The selected alternative includes the following major components.

- Lime sludge cap meeting Resource Conservation and Recovery Act (RCRA) technical performance standards.

- Ground water extraction wells in the upper sand aquifer between Coon Creek and the landfill.

- Clay slurry wall around the Pit with pumping inside the wall.

- Institutional controls to prohibit uppers sand aquifer wells at the site and just north of Coon Creek and to prohibit lower sand aquifer wells near the landfill.

- Carbon adsorption treatment of extracted ground water (air stripping or a combination is possible based on design.

- Discharge of treated extracted ground water to Coon Creek.

- Monitoring, including geophysical work around the site to locate heavier-than-water non-aqueous phase liquid monitoring, to assure the effectiveness of the remedy.

Consistent with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R Part 300, I have determined that, at the Waste Disposal Engineering Site, the selected remedial alternative is cost-effective, provides adequate protection of public health, welfare, and the environment, and utilizes treatment to the maximum extent practicable.

The action will require operation and maintenance activities to ensure continued effectiveness of the remedial alternative as well as to ensure that the performance objectives meet applicable State and Federal surface and groundwater criteria.

I have determined that the action being taken is consistent with Section 121 of SARA. The State of Minnesota has been consulted and is expected to concur with the selected remedy.

In accordance with Section 121 (c) of SARA, the remedial action at the Waste Disposal Engineering Site shall be reviewed no less often than every five years after initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented.

for Frank M. Covington 12-31-87

Valdas V. Adamkus Date
Regional Administrator

Attachments: (1) Summary of Remedial Alternative Selection
(2) Responsiveness Summary
(3) WDE Administrative Record Index

Site Summary of Remedial Alternative Selection
Waste Disposal Engineering Site
Andover, Minnesota

I. Site Location and Description:

The WDE Site is located within the City of Andover (formerly Grow Township), Anoka County, Minnesota (see Attachments 1, 2), approximately 15 miles north of the City of Minneapolis. It is situated on the south side of Coon Creek, which discharges into the Mississippi River 11 river miles downstream from the Site. The discharge into the Mississippi River is approximately 3 miles upstream of the intake for the St. Paul water supply and 7 miles upstream of the intake for the Minneapolis water supply.

The WDE Site is situated within the Anoka Sand Plain. The topography is gently rolling to flat, with shallow water tables (less than 20 feet) and numerous wetlands. The area surrounding the WDE Landfill historically was comprised of small farms and small residential developments. Immediately south of the Site are a series of scrapyards. During the past year, more extensive residential development has been or will be constructed and planned for around the Site. The Site is bounded on the north by Coon Creek, with flows in a west-northwesterly direction at this location. To the west, the Site is bounded by Anoka County Road 18 (Crosstown Boulevard), farm land, and a residential development (Red Oaks Manor). The southern boundary of the Site consists of woodlands and commercial developments (mostly scrapyards) along Anoka County Road 16 (Bunker Lake Boulevard). Hanson Boulevard borders the eastern edge of the WDE Site. Along the eastern edge of the Site are two overlapping easements, United Power Association (45 feet wide) and Northern States Power Company (150 feet wide).

The original dump was established in 1963 by a Mr. Leonard Johnson. Disposal of wastes was by burial or burning in pits or trenches. WDE purchased the facility in 1968 and was licensed by Grow Township to operate as a sanitary landfill. In 1970, WDE submitted a solid waste permit application to the MPCA, including a proposal to build a specially constructed pit for disposal of hazardous waste. The permit (SW-28) was issued on March 30, 1971 to operate the WDE Site as a sanitary landfill. The Site operating permit was revoked by the MPCA in February, 1984.

The hazardous waste pit received hazardous wastes from November, 1972 to January, 1974. The base of the pit was specified to be an 18-inch layer of clay overlain by a six-inch bituminous layer and six inches of crushed limestone. Approximately 6,600 containers (ranging from 1 gallon pails to 55 gallon drums) holding a wide variety of wastes (acids, caustics, waste paints, spent solvents, plating sludges, cyanides) are thought to have been disposed in the pit. An undetermined quantity of hazardous waste, much of it as bulk loads, was disposed throughout the landfill. Based on interviews and government files, approximately 3.2 million gallons of hazardous waste are thought to have been disposed at the WDE Site. Using these estimates, only 10 percent of the waste expected to be at the Site would have been disposed in the pit.

The area of actual refuse disposal in the landfill covers an area of 73 acres (see Attachment 3). The maximum thickness of waste is 40 feet. The landfill contains nearly 2.5 million cubic yards of waste. Much of the landfill is covered by lime sludge obtained from the Minneapolis Drinking Water Treatment Plant. The lime sludge consists of very fine particles of lime that yields a clay-like substance. The sludge thickness ranges from three to six feet (average of four feet). Additional lime sludge is stockpiled on ten acres immediately southeast of the area of refuse disposal.

The WDE facility ceased operations in February, 1984 and has remained abandoned and inactive. The property of the Site has gone through tax forfeiture so that it is currently property of the State of Minnesota with administration by Anoka County.

II. Site History:

Prior to development of the WDE Site in the early 1960's, land use consisted of cropland and pastureland, and open deciduous woodland with scattered wetland pockets. The area consisted of a glacial outwash plain characterized by low relief, poor external drainage, and fine, sandy soil. Also located at the Site were two related drainage channels. One of these channels was eventually buried by the landfill while the other was abandoned when Coon Creek was straightened. In addition, by 1964, three field ditches had been constructed on the northeast portion of the present landfill. These ditches, which are partially buried, drain to the north and empty into Coon Creek.

As indicated earlier, the landfill (dump) was established in the early 1960's by Leonard E. Johnson. By 1964, the dump covered only three acres. In 1970, the landfill had expanded to cover 41 acres, and by 1982 to its present-day size of 114 acres. The dump was purchased by WDE in 1968. In 1971, construction of the WDE Pit began. The Pit was completed in 1972 and was operated until January, 1974. The landfill operated until 1984.

III. Results of the Remedial Investigation:

A. Investigations

Investigations at the Waste Disposal Engineering (WDE) Site included the following:

1. Review and evaluation of historical disposal practices and other records relating to the Site.

2. Extensive aquifer sampling and water level measurements to determine ground water quality, flow directions, etc.

3. Soil sampling in the northeast portion of the Site to define soil contamination in the area of historic drainage ditches.

4. Coon Creek sampling to define the Site's impacts on the creek.

5. Soil borings to define the geology at the Site.

6. Lime sludge testing to define whether or not it could be considered as a component of the landfill cap.

7. Landfill gas measurements to define gas levels within the landfill.

B. Geology

The WDE Site is situated within the Anoka Sand Plain. The surficial deposits were glacial meltwater deposits (forming outwash plains associated with Grantsburg Sublobe later reworked by the Mississippi River). These deposits are fine to medium sand, have relatively high permeabilities, and are 40 to 73 feet thick at the landfill. The outwash plain is relatively flat, and lacks good drainage. Numerous small lakes and wetlands reflect high water table conditions. Many streams in the area, including Coon Creek, have been channelized to lower inverts and improve drainage. Several drainage ditches were present in the Northeast quarter of the Site prior to the landfilling.

There is a thin, gray silt till unit (0 to 15 feet thick) within the Upper Sand Unit. This silt till is present in most deeper borings at the Site at depths around 30 to 40 feet. However, its continuity is uncertain, because its presence is not indicated in some drilling logs, and it is not relied upon as an effective confining unit.

Below the Upper Sand is a red-brown clay-silt till. It is a relatively dense till, has low permeabilities [10^{-5} to 10^{-6} centimeters per second (cm/sec)], and serves as an aquitard for the underlying lower sand. The till thickness ranges from 10 to 40 feet thick and becoming progressively thinner from north to south across the Site. The surface of the till unit is highest immediately below the Pit area of the landfill, and slopes downward concentrically from the peak (see Attachment 4). The steepest slope is to the northwest and west.

Underlying the red-brown till is the Lower Sand. This outwash was deposited by the Superior advance and retreat and consists of relatively coarse sand and gravel. It becomes finer and more silty with depth. The thickness of this unit is on the order of 80 feet thick.

C. Ground Water

The Upper Sand aquifer is under water table conditions (unconfined). Ground water flow in the Upper Sand at the Site is pronounced to the north discharging into Coon Creek (see Attachment 5). Coon Creek serves as the regional discharge for the Upper Sand aquifer. At the Site, the water table contours parallel Coon Creek. Ground water elevations are generally in the range of 867 feet near the Creek to 880 feet south of the landfill. Ground water flow rates in the Upper Sand are on the order of 25 to 30 feet per year.

The Lower Sand aquifer is under confined conditions and is artesian under the WDE Site. In fact, in the vicinity of Coon Creek, flowing artesian conditions exist (i.e., monitoring well 26D). Ground water flow in the Lower Sand aquifer in the region is to the southwest, ultimately discharging into the Mississippi River, approximately 4 miles downgradient of the WDE Site. At the WDE Site, ground water flow appears to be more towards the west-northwest because of the readings from one particular monitoring well. Without this one well, ground water flow patterns would be entirely consistent with the regional pattern. Piezometric levels in the Lower Sand aquifer are generally in the range of 876 to 878 feet at the Site.

The Lower Sand aquifer is used extensively for domestic water supply, particularly southwest (and downgradient) of the Site. The Upper Sand aquifer is used by some residents having sand points, particularly north of Coon Creek. One issue of primary concern has been the relative vertical piezometric gradients within the Upper Sand aquifer and between the Upper Sand aquifer and Lower Sand aquifer across the red-brown till confining unit. This is particularly critical since the gradients and flow directions are roughly opposite between the Upper Sand aquifer and Lower Sand aquifer.

In general, there is a downward component of flow within the Upper Sand at the WDE Site, except as one approaches Coon Creek where the gradient switches to produce an upward flow.

The vertical gradient across the red-brown till unit between the Lower Sand and Upper Sand aquifers is upward under the limits of refuse disposal and the area between the refuse and Coon Creek. The vertical gradient across the red-brown till unit between the Lower Sand and Upper Sand aquifers is downward immediately south of the limits of refuse disposal. The gradient is consistently downward at monitoring well nest 1 and is variable (downwards and upwards) at monitoring well nest 23 (see Attachment 6).

The lateral ground water gradient in the Upper Sand aquifer is approximately 0.005. With a hydraulic conductivity of 1.6×10^{-3} cm/sec and an assumed porosity of 0.3, the average lateral ground water movement in the Upper Sand is approximately 27 feet per year. The vertical ground water gradient across the red-brown till at well nest 1 is 0.038 using a hydraulic conductivity range of 2×10^{-6} cm/sec to 1×10^{-3}

cm/sec and an assumed porosity of 0.3, the average vertical ground water velocity downward across the red-brown till is approximately 0.4 to 2.0 feet/year. This is 1.5 to 7.4 percent of the lateral flowrates. Therefore, ground water flow in the Upper Sand aquifer is primarily lateral towards Coon Creek, but there is a downward component across the red-brown till south of the limits of refuse disposal (see Attachment 7).

D. Extent and Magnitude of Contamination

Ground water contamination exists within the Upper Sand aquifer beneath and downgradient of the landfill and ultimately enters Coon Creek. The degradation is most severe in the upper portion of the Upper Sand aquifer. Contaminants include typical landfill type contaminants (reduced pH, chlorides, and COD) and a wide variety of organic constituents, including aromatic and halogenated volatiles, and low levels of metals (see Attachments 8 to 12). Some of the volatile organics found in highest concentrations include methylene chloride, dichloroethylene, trichloroethane, tetrahydrofuran, methyl ethyl ketone, benzene, and xylenes.

The areal distribution of contaminants show the most severe contamination at and downgradient of the pit (wells W6, W8, W11, and W22A). High concentrations or "hot spots" were detected at other scattered locations (i.e., W28A, and W31A) within the landfill, reflecting the scattered pattern of disposal practices throughout the history of the landfill operations. At this point in time, the Pit area shows the most serious ground water degradation and is the dominant source of contaminants, notably volatile organics, entering Coon Creek. Contamination in the Upper Sand is most severe near the water table and decreases with depth, producing a stratified plume (see Attachment 13).

Coon Creek is the primary receptor of contaminated ground water in the Upper Sand aquifer leaving the WDE Site. No contaminants, particularly volatile organics, are detectable upstream of the WDE Site. Very low levels of some volatile organics are detectable along most of Coon Creek along the north side of the WDE Site until the contaminant plume from the Pit enters the Creek. At that point, the levels of a variety of volatile organics, particularly chlorinated volatiles, are present, and persist several miles down stream of the Site. Non-halogenated volatiles are observed in high concentrations in ground water near the Creek and are thought to volatilize quickly upon entering the Creek. However, the non-halogenated volatiles do persist when ice cover conditions exist. The levels of volatiles in Coon Creek where the Pit plume enters the Creek are in the range of 1 to 30 ug/l for several different halogenated volatiles. There is some contamination present in one monitoring well nest immediately north of Coon Creek, but this appears to be due to some localized underflow and reversal back to Coon Creek because of some fine-grained lenses under Coon Creek. None of the private wells further north of the creek show any contamination.

The Lower Sand aquifer has not shown any indications of contamination to date. A number of factors are responsible for the lack of impact, including the presence of 10 to 40 feet of a dense till confining the aquifer, an upward gradient across the till unit, and a pronounced flow in the Upper Sand aquifer northwards towards Coon Creek. However, the long-term integrity of the Lower Sand aquifer cannot be completely guaranteed. The gradient across the till is downward immediately south of the landfill and, if ground water conditions were to shift in the future, the downward gradient may expand northward under the landfill. Also, heavier-than-water, non-aqueous phase liquids (NAPL) may migrate along the surface of the till southward (down the slope of the till surface) to the zone of downward gradients and, in the long-term, potentially impact ground water quality. Thirdly, most of the residential wells southwest (and downgradient, in terms of the regional flow, in the Lower Sand) of the WDE Site are completed in the Lower Sand and may be impacted if serious contamination were to reach the Lower Sand aquifer. The presence of such a large number of wells southwest of the Site does have the potential to aggravate the downward gradient condition southwest of the Site.

E. Landfill Gas

The WDE Site has 11 gas probes, located primarily along the western and southern sides of the landfill (see Attachment 5). Probes were installed at these locations because Coon Creek (along the north and northeast sides of the Landfill) provides a hydraulic barrier to gas migration and because the closest residential developments are in these directions. Also, some evergreen trees immediately along the west side of the landfill are showing signs of stress. Combustible gas measurements show the highest levels (15 to 30 percent) in gas probe nest 6, with a few percent levels in probes 1 and 4. Volatile organics analyses also indicate the presence of a variety of organics, principally halogenated organics, in the gas probes. As with combustible gas, probes GP-1, GP-4, and GP-6 show the highest concentrations and the largest variety of volatile organics (see Attachment 16). These gas probes are immediately adjacent to the landfill and represent the worst case (Attachment 16). Probes further from the landfill (GP-2, GP-9, GP-10 show much lower vapor gas concentrations and fewer compounds) and those along the south are completely clean. The fact that gas migration seems to be very limited beyond the landfill is due to the relatively high water table conditions and the high porosity and permeability of the surficial deposits in the area. Some of the levels of individual contaminants (1,1,2,2-tetrachloroethane, 1,3-dichloropropene) do exceed Threshold Limit Values in GP-4 and GP-6 immediately adjacent to the landfill. In addition, the levels of some contaminants (methylene chloride, benzene, trichloroethene) exceed the potency factors for carcinogens identified in the Public Health Risk Evaluation Data Base. With the fact that methane and specific volatile gases are being generated and that the landfill is a relatively young facility (most waste disposed in the last 10 years), concerns do remain regarding long-term migration of gases.

F. Wetlands

The wetlands north of the site are listed in the National Wetland Inventory as a Type 2 wetland (Class Palustrine, emergent, subject to intermittent flooding, drained). The U.S. Fish and Wildlife Service has identified the presence of sedges, reed canary grass, cattails, and willows.

IV. Potential Receptors and Pathways:

A. Potential Receptors

Land resources in the area are used for agriculture, residential, and light industrial purposes. Some land is undeveloped. No unique agricultural land or wildlife habitat exist around the Site. (See Attachment 14).

Potentially impacted water resources consist of the groundwater in the Upper and Lower Sand aquifers and surface waters in Coon Creek and the Mississippi River. Although used as a source of potable water in the area, including just north of the Site, the Upper Sand aquifer is less significant as a potable water source than the Lower Sand aquifer. Mississippi River irrigation and livestock watering are other possible uses of the ground and surface waters.

Coon Creek and the Mississippi River are important to wildlife in the area and contain fish and other aquatic organisms.

Wetlands between the limit of refuse disposal and Coon Creek, particularly in the area of monitoring well nests 2 and 13, have been impacted by seeps and shallow leachate of the Site. Migrating waterfowl may utilize these wetlands.

B. Releases

The WDE Site has a variety of exposure pathways, existing or potential, for the release of hazardous substances. The existing pathways include ingestion/dermal exposure from contamination of Coon Creek by Upper Sand ground water, and direct contact for people on site with exposed wastes and leachate. There is also the risk of physical injury due to the existing hazards at the Site (i.e., exposed cables, rusty drums, etc.). Potential pathways include contaminated drinking water from contaminated ground water from leakage into the Lower Sand (i.e., NAPL) or migration beneath Coon Creek within the Upper Sand. Controls are necessary to protect public health, welfare, or the environment from the continuing releases of hazardous substances. The releases are described as follows:

1. Heavily-contaminated ground water within the Upper Sand aquifer, particularly from the Pit, is currently discharging into Coon Creek resulting in low but persistent levels of various chlorinated volatile organics.

2. Leachate seeps are sporadically active near the base of the north face of the landfill near Coon Creek. When the leachate seeps are active, they do pose a direct contact risk to people and wildlife on WDE Site. The leachate seeps ultimately drain into Coon Creek via interflow or overland flow.

3. Landfill wastes, and potentially hazardous wastes, are gradually being exposed as the existing, unprotected lime sludge cap erodes. The lime sludge alone does not support any vegetative cover and, because of the very fine-grain size, is subject to wind erosion under dry conditions and runoff erosion during periods of even moderate rainfall. Extensive and deep (up to 10 feet deep) gullies have developed particulately in the northwest quarter of the landfill. As the lime sludge cap erodes, the potential for direct contact exposure to wastes increases over time. Although the potential for direct contact is low, there is some undefined chance for acute exposures.

4. Ground water contamination in the Upper Sand aquifer greatly exceeds U.S. EPA Maximum Contaminant Levels established under the Safe Drinking Water Act and Water Quality Criteria established under the Clean Water Act and Minnesota Recommended Allowable Limits (RAL's). The highest levels of contamination are at and downgradient of the Pit and in isolated/random locations in the landfill (so called "hot spots"). Although the ground water contamination is largely limited to the site, being discharged to Coon Creek, there is one small pocket of contamination exceeding RAL's and nearing Water Quality Criteria, but exceeding only methyline chloride, in the vicinity of well nest 21, raising concerns regarding the adequacy of Coon Creek as a complete hydraulic barrier. There are also long-term concerns regarding NAPL migration in the Upper Sand, and contamination entering the Lower Sand aquifer due to NAPL migration or dissolved contaminants migrating downward south of the Site. To date, no contamination has been detected in private wells.

5. Gas, both methane gas from the landfill and individual volatile organics from wastes, is being released from the Site and to the west. Gas migration does appear to be limited due to these high porosity and permeability of the surficial soils.

C. Exposure Pathways

The WDE FS defined thirteen exposure routes from which response objectives were derived (See Attachment 15). The routes are as follows:

1. Inhalation of Dust and/or Volatilized Chemicals (dust includes contaminants absorbed to dust particles). Three groups of people are expected to be affected by such a release: on-site investigators/workers, trespassers, and nearby downwind residents. The response objective is to control the potential dust and/or volatilized chemical emissions.

2. Inhalation of Chemicals as a Result of Incompatible Waste Reactions. Potential incompatible waste reactions range from minor reactions that may increase or decrease the rate of chemical releases from the site to major reactions that release large volumes of volatilized chemicals. The large volume release from an undisturbed landfill has a low probability due to the slow rate of release of individual containers, the sorbent properties of the solid waste, the buffering affect of surrounding soils, and the cool temperatures and anaerobic conditions in the landfill. No major release has been recorded. The response objective is to reduce the probability of incompatible waste reactions and to control the effects of reactions that may occur.

3. Inhalation of Lime Sludge Tracked Off-Site by Local Residents As local residents use the site for recreational activites and as most of the site is covered by lime sludge, lime sludge is expected to be tracked off-site and inhaled as dust. The response objective is to remove the opportunity for contact with the lime sludge.

4. Inhalation of Soil Gas Contaminated by the Pit and Landfill. Landfill gas is generated at every sanitary landfill by the anaerobic decomposition of solid waste. This gas can be pushed out into surrounding soils. The gas can also carry volatilized organic compounds from industrial wastes. Gas was present in the soil, although no volatile organic compounds were above detection limits in the ambient air. The response objective is to control soil gas migration.

5. Ingestion of Lime Sludge Tracked Off-Site by Local Residents. As local residents use the site for recreational activities and as the site is covered with lime sludge, lime sludge is expected to be ingested. The response objective is to remove the opportunity for contact with the lime sludge.

6. Ingestion of Lime Sludge On-Site. On-site investigators/workers and trespassers are expected to be exposed. The response objective is to prevent the opportunity for contact with the lime sludge.

7. Ingestion of Upper Sand Aquifer Water Contaminated by the Pit. The ground water contamination from the pit area appears to be confined to the Upper Sand aquifer and to discharge into Coon Creek. As the till layer mounds under the Pit, NAPL could

migrate off-site in virtually any direction because it will tend to follow the slope of the till layer rather than the ground water flow. The response objectives are to control future exposure to Upper Sand aquifer ground water both from areas that may become contaminated and from areas where pumping may affect contaminant distributions, and to eliminate, or minimize, future contaminant releases to Coon Creek and subsequently the Mississippi River.

8. Ingestion of Upper Sand Aquifer Water Contaminated by the Landfill. The ground water contamination from the landfill also appears to be confined to the Upper Sand aquifer and to discharge into Coon Creek. As the till layer mounds under the landfill, NAPL could migrate off-site in virtually any direction. Although specific contamination sources may be less significant than the Pit, the area impacted, and therefore the total release, may ultimately be substantial. No receptors exist between the landfill and creek at this time. The response objectives are to control future exposure and minimize future releases to the Upper Sand aquifer, and to eliminate or minimize future contaminant releases to Coon Creek and subsequently the Mississippi River.

9. Ingestion of Lower Sand Aquifer Water Contaminated by a Release from the Upper Sand Aquifer. Although the Lower Sand aquifer does not show any impact from the site at this time, it is an important drinking water source that must be protected. The possibilities for future contamination are primarily if contaminated groundwater flows through the till layer because the existing upgradient is reversed, or heavier than water non-aqeous phase liquids (NAPL) accumulate on the till surface and reach sufficient depth to push through the till against the upgradient. The response objective is to protect the Lower Sand aquifer by controlling vertical gradients and the impact of NAPL accumulation.

10. Ingestion of Water and Fish from Coon Creek. Low level contamination from the site has been found in the creek. The response objective is to eliminate or minimize contaminant loadings to Coon Creek.

11. Ingestion of Exposed Waste/Leachate. Trespassers and on-site investigators/workers could be affected by such an exposure. The response objectives is to prevent exposure to waste/leachates.

12. Dermal Contact with Coon Creek. Although the creek is not an attractive water sport stream, children may play in the creek. The response objective is to eliminate or minimize contaminant loadings to Coon Creek.

13. Dermal contact with Exposed Waste and/or Leachate. Trespassers and on-site investigators/workers could be affected by such an

exposure. The response objective is to prevent direct contact to exposed waste/leachate.

V. Alternatives Evaluation:

A. Response Objectives

The response objectives are listed from the "Exposure Pathways" discussion, above (see IV.C.), as follows:

1. Control potential dust and/or volatilized chemical emissions.

2. Control contact with lime sludge.

3. Control contact with exposed waste/leachate.

4. Minimize contaminant releases to the Upper Sand aquifer.

5. Eliminate or minimize contaminant releases to Coon Creek.

6. Reduce the probability of incompatible waste reactions.

7. Control the effects of possible reactions that may occur.

8. Control future exposure to the contaminated Upper Sand aquifer.

9. Protect the Lower Sand aquifer by controlling the vertical gradient and the impact of heavier-than-water non-aqueous phase liquid (NAPL) accumulation.

10. Control soil gas migration.

B. Alternatives Screened

The Feasibility Study analyzed a wide variety and large number of alternatives to deal with the various releases identified previously. The alternatives are:

1. No Action

2. Capping
   a. Normal Portland Concrete Pavement
   b. Asphaltic Concrete Pavement
   c. In-situ Soil Admixtures
   d. Sprayed-on Covers
   e. Low Permeability Soil Cover Meeting MPCA Solid Waste Rules
   f. Low Permeability Soil Cover Exceeding MPCA Solid Waste Rules

g. Low Permeability Soil Cover to RCRA Performance Standards
h. Synthetic Membranes to RCRA Performance Standards
i. Composite Construction to RCRA Performance Standards

3. Ground Water Cut-Off Wall

   a. Slurry Wall
   b. Sheet Piles
   c. Injected Screens
   d. Grout Curtain

4. Ground Water Pumping

   a. Treatment Options
   b. Disposal Options

5. Leachate Collection Drain

6. Site Grading

7. Waste Removal (Excavation)

8. Deep Well Injection

9. Incineration

10. Landspreading/Biotreatment

11. Temporary Warehousing

12. Off-Site Hazardous Waste Landfill

13. On-Site Hazardous Waste Landfill

14. Landfill Closure

    a. Rodent Control
    b. Maintenance
    c. Final Cover/Vegetation
    d. Gas
    e. Drainage

All of the alternatives were screened in the Alternatives Report (dated April 18, 1986), with some alternatives being eliminated from further consideration. The remaining alternatives, which are discussed below under "Alternatives Considered" (see VII.,B., below), were more fully evaluated in a Detailed Analysis Report (dated October 9, 1986).

C. <u>Alternatives Considered</u>

1. <u>No Action</u> - This alternative discusses actual and potential impacts caused by contamination from the Waste Disposal

Engineering (WDE) Site if no cleanup actions are taken. It is used as a baseline against which other alternatives are compared and includes site monitoring. The alternative includes long-term monitoring and covers the following:

a. Contaminant monitoring in the Upper Sand aquifer through wells along the landfill perimeter, primarily downgradient of the wastes, and within the landfill to act as an earlier warning of releases of contaminants (includes residential wells).

b. Contaminant monitoring in Coon Creek.

c. Monitoring through wells of the Lower Sand aquifer to assure contamination is not occurring and to monitor gradient between the Upper and Lower Sand aquifer.

d. NAPL monitoring wells with sumps to collect NAPL. Wells are proposed for known areas of higher level contamination. In addition, a geophysical investigation is proposed to locate low areas around the landfill where additional monitoring can be placed.

e. Monitoring of gas migrating beyond the landfill.

f. Background wells in the Upper and Lower Sand aquifers, and in Coon Creek to define ambient conditions in areas not contaminated by the landfill.

2. Capping - This alternative involves placing a low permeability cover over the area of concern. The cover would be vented to avoid gas build-up. The cap would eliminate the opportunity for direct contact with the waste, stabilize the waste pile, discourage rodents and other vermin, control odors and vapors, control surface run-off, control dust, promote vapors, transpiration, and control the percolation of water into and through the waste (infiltration). The more water going through the waste, the more leachate (contaminated liquid) produced. There were five capping alternatives considered:

a. Low Permeability Cover Exceeding Minnesota Pollution Control Agency (MPCA) Standards. This cap consists of grass vegetated cover, over 6 inches (") of topsoil, over 6" of sand lateral drainage [hydraulic conductivity (K) around 1 X 10^{-3} centimeters per second (cm/s)], over 24" of compacted clay (K less than or equal to 2 X 10^{-8} cm/s).

b. Low Permeability Cover Meeting Resource Conservation and Recovery Act (RCRA) Performance Standards. This cap consists of grass vegetated cover, over 6" of topsoil, over 30" of clean fill, over geotextile filter fabric, over 12" of sand lateral drainage (K greater than or equal to 1 X 10^{-3} cm/s), over 24" of compacted clay (K less than or equal to 1 X 10^{-7} cm/s).

c. Synthetic Liner Meeting RCRA Performance Standards. Cap consists of grass vegetated cover, over 6" of topsoil, over 12" of clean fill, over geotextile filter fabric, over 6" of sand lateral drainage (K greater than or equal to 1 X 10^{-3} cm/s), over high density polyethylene synthetic liner, on 6" of sand cushion.

d. Composite System Meeting RCRA Performance Standards. This cap consists of grass vegetated cover, over 6" of topsoil, over 24" of clean fill, over geotextile fabric, over 12" of sand lateral drainage (K greater than or equal to 1 X 10^{-3} cm/s), over high density polyethylene synthetic liner, over 6" of sand cushion, over 24" of compacted clay (K less than or equal to 1 X 10^{-7} cm/s).

e. Lime Sludge Meeting RCRA Technical Performance Standards. This cap consists of grass vegetated cover, over 6" of topsoil, over 30" of clean fill, over geotextile filter fabric, over 12" sand lateral drainage (K greater than or equal to 1 X 10^{-3} cm/s) over 36" of lime sludge (K less than 2 X 10^{-6} cm/s).

3. Groundwater Cut-off Wall with Cap. This alternative involves a cap (see item 2., above) and a low permeability perimeter barrier which would be keyed into the red/brown silt till (the till layer between the Upper and Lower Sand aquifers). The perimeter barrier wall would consist of a soil-bentonite slurry wall which will contain contaminants within the wall. To insure an inward gradient across the wall the groundwater level within the wall would be kept lower than outside the wall. If a leak occurs the inward gradient will cause water to flow into the walled area thereby avoiding discharges outside the wall. Two methods of maintaining the inward gradient are:

a. Groundwater Extraction Wells. The water level within the wall is lowered by a pump-out well.

b. Groundwater Collection Drain. The water level within the wall is lowered using perforated pipe connected to a sump. The water in the sump would then be pumped-out.

4. Groundwater Interception and Extraction. This alternative involves a cap (see item 2., above) and interception and removal of contaminated groundwater from the Upper Sand aquifer through creation of a hydraulic barrier.

a. Groundwater Pumping With Cap. This involves wells to intercept and extract contaminated groundwater from the Upper Sand aquifer downgradient of the waste site.

b. Groundwater Collection Drain. This involves perforated pipe to intercept the flow of groundwater downgradient of the waste site. The pipe leads to a sump. The sump is pumped-out to extract the water.

5. Excavation of the Pit. This alternative involves removal of about 5500 cubic yards of material, including drummed wastes and contaminated soil. Removal is expected to occur at least to the asphalt lining of the Pit. Disposal is expected via one or a combination of the following:

   a. On-site RCRA facility. This would involve redisposal of wastes consistent with RCRA at the site.

   b. Off-site RCRA facility. This would involve transportation and disposal of wastes at an existing compliant facility away from the site.

   c. Incineration of wastes in a rotary kiln incinerator operated at the site. Liquid wastes from quenching and scrubbing would be collected and disposed at a RCRA facility or treated and discharged. Residual materials remaining after incineration would be disposed at a RCRA compliant facility or delisted and buried on-site.

6. Excavation and Disposal and Groundwater Pumping of the Pit Area. This alternative is a combination of items 4.a. and 5, above.

7. Treatment of Extracted Groundwater.

   a. Air Stripping. By exposing contaminated water to the air volatile compounds are removed from the water. This alternative is often used for low level volatile compound contamination or to reduce or eliminate some contaminants prior to treatment with other processes such as activated carbon. As contaminants are discharged into the atmosphere, activated carbon treatment is often required of the contaminated air before it is discharged into the atmosphere.

   b. Carbon Adsorption. Contaminated water is exposed to the activated carbon. The carbon removes contaminants and must be replaced periodically.

   c. A combination of a) and b), above. These technologies can be used together to reduce air pollution caused by air stripping via activated carbon, to increase the life of the activated carbon by air stripping, or to increase contaminant removal efficiencies.

8. Disposal of Extracted Groundwater.

a. Coon Creek. This involves direct discharge to Coon Creek.

b. Publicly Owned Sewage Treatment Works. This involves discharge to a nearby sanitary sewer, which would discharge to the sewage treatment plant.

c. Infiltration. This involves discharge into an in filtration pond, which allows treated water to reenter the Upper Sand aquifer.

d. Irrigation/Evapotranspiration. This involves land application of the discharge.

D. Compliance with Legally Applicable, or Relevant and Appropriate Requirements (ARARs).

Alternatives 2, 3 and 4 involve capping the Site. Resource Conservation and Recovery Act (RCRA) requirements for closure of a RCRA landfill is an ARAR for capping the Site.

Alternatives 3 and 4 involve groundwater extraction and discharge. If discharge is to Coon Creek (alternative 8.a.) or land application (alternative 8.d.), National Pollutant Discharge Elimination System (NPDES) permit requirements are an ARAR. If discharge is to the sanitary sewer (alternative 8.b.) an agreement with the Metropolitan Waste Control Commission (MWCC) in accordance with its pretreatment program under the Clean Water Act is an ARAR.

Alternatives 2, 3 and 4 must attain Army Corps of Engineer 404 permit requirements for construction of the cap in the floodplain. Filling of wetlands in the floodplain must also meet these requirements.

Alternatives 1, 2, 5 and 6 would allow continued discharge of contaminated water to Coon Creek where Water Quality Criteria and drinking water standards (for the Mississippi River) would apply.

Alternatives 2 through 8, would involve air emissions either through excavation or through ground water extraction and treatment which must be considered under the Clean Air Act and State requirements.

E. Reduction of Toxicity, Mobility, or Volume

Alternative 1 does not reduce toxicity, mobility, or volume.

Alternative 2 will reduce the mobility of contaminants in the waste and the volume of contaminants entering the groundwater by restricting infiltration through the waste. Because the volume and mobility of contaminants is reduced, the toxicity of the contaminated groundwater is reduced.

Alternative 3 has the advantages of alternative 2 plus it further reduces the mobility, toxicity and volume of contaminated groundwater and NAPL discharges off-site by containing them within the barrier. A concern is that if not extensively monitored, NAPL discharges may pool along the barrier wall and that the weight of the NAPL will cause it to penetrate and contaminate the Lower Sand aquifer. Consequently, the barrier is considered more desirable for a smaller area which can be more easily monitored (i.e., the Pit).

Alternative 4 has the advantages of alternative 2, plus it further reduces the mobility, toxicity, and volume of contaminated groundwater by creating a hydraulic barrier to contain such contamination on-site, as well as reduce it through groundwater extraction. This alternative does not contain NAPL discharges.

Alternative 5, by exposing deteriorating drums of incompatible wastes, has a potential for causing a significant increase in the toxicity, mobility, and volume of contaminant discharges to the air and groundwater during the excavation and handling of wastes. The long-term reduction of toxicity, mobility and volume of contaminants from the material excavated would be significant, after the risks of excavation are experienced. This would not affect contamination of the groundwater from the rest of the landfill.

Alternative 6 has the benefits of alternatives 4 and 5 for the contaminated groundwater around the Pit area.

F. <u>Short-term Effectiveness</u>

Alternative 1 would not be effective in addressing contamination from the site. It would monitor conditions at the site.

Alternative 2 would cause short-term impacts due to construction of the cap. These would include noise from heavy equipment, dust, and increased chances for direct contact with wastes by construction personnel. If the lime sludge is not used, exposure of wastes, and removal and disposal of the lime sludge would cause additional risks. The chances for contact with wastes, contaminated gas releases, and infiltration through the wastes would be reduced by the cap.

Alternative 3 would pose risks associated with alternative 2 plus risks to workers placing the barrier wall. Groundwater contamination and NAPL discharges within the barrier would be contained. NAPL levels for the Pit barrier alternative would be reduced, as needed, within the barrier by extraction wells.

Alternative 4 would pose risks associated with alternative 2 plus some minimal short-term risk during construction to workers. Groundwater contamination would be contained and reduced through groundwater extraction. NAPL would not be contained.

Alternative 5 would pose significant short-term risk due to the excavation and handling of incompatible wastes. Work-rs, local populations, the air, groundwater and surface water could be impacted by short-term discharges.

Alternative 6 has short-term impacts of alternatives 4 and 5 except that to the extent the sources of NAPL are removed without incident, there would no longer be sources of NAPL from the Pit.

G. Long-term Effectiveness and Permanence

Alternative 1 would not be effective in addressing contamination from the site. Continuous professional management would be required to assure that responses could be initiated based on the monitoring. The determination and timeliness of required actions would also be of concern. The reliability of this alternative alone is suspect due to the complexity of the management required.

Alternative 2 would require long-term care of the cap. The chances for contact with the wastes, contaminated gas releases, and infiltration through the wastes would be reduced. The lime sludge cap has greater long-term risks due to uncertainties in the use of lime sludge. Its advantages are it is already on-site, and if not used, would be a significant disposal problem as it would need to be removed.

Alternative 3 would require care and monitoring of the barrier wall. Groundwater contamination and NAPL within the barrier wall would be contained. For the landfill, where NAPL could accumulate undetected against the barrier wall due to the lenth of such a wall, there would be additional concern due to the potential that such an event could cause contamination in the Lower Sand aquifer over the long term. NAPL accumulation is expected to be detected by monitoring wells and controlled by pumping out those wells within the smaller Pit barrier, if necessary. Any breach in the wall could be discovered by the increased pumping rates necessary to maintain an inward gradient across the wall. Replacement would be expensive.

Alternative 4 would require minimal additional construction. Groundwater interception and extraction is commonly used, reliable, and replacing wells is relatively inexpensive. Long-term operation and maintenance is required. Groundwater contamination is contained and reduced. NAPL is not contained.

Alternative 5 would require long-term care of any excavated contaminated materials remaining on-site. If disposed off-site, risks due to transportation, accidents, and redisposal would occur. If contained on-site, some leakage of the containment facility and spreading of contamination is possible, although less than from the existing Pit. Long-term care would be required of an on-site facility.

Long-term NAPL discharge from excavated materials would not be expected.

Alternative 6 is a combination of alternatives 4 and 5 for the Pit and would have the same impacts.

H. Implementability

Alternative 1 is easily implemented, but less reliable than other alternatives.

Alternative 2 is common and easily constructed. Caps utilizing liners would be more difficult due to the need to reduce slopes such that the liner would not tear.

Alternatives 3 and 4 would be required to meet National Pollutant Discharge Elimination System (NPDES) permit requirements for discharges to Coon Creek, or an agreement with the publicly owned sewage treatment works for discharge to the sanitary sewer. Alternative 3 could be more difficult to construct such that adequate containment is achieved. Alternative 4 is common and easily constructed. Capture zones can be measured to assure adequate coverage. NAPL would not be addressed.

Alternative 5 would be difficult due to the need to excavate the wastes, and, in the case of incineration, site an incinerator. Also, some wastes may be prohibited from being landfilled.

Alternative 6 would be the same as 4a and 5 except NAPL would be addressed if not caused during excavation.

Alternative 8a would be reliable and would require the equivalent of an NPDES permit. Implementability is expected to be easy, however this cannot be assured until the permit conditions are known during design.

Alternative 8b would be reliable and would require compliance with the pretreatment requirements of the POTW. Implementability is technically easy, however problems with acceptance by the POTW due to the dilute nature of the waste stream and depletion of the area's growth capacity allocation at the POTW are concerns.

Alternative 8c would be easily implemented, outside problems with land aquisition, but causes concern due to the addition of water to an area of the Upper Sand aquifer, just south of the Site, where a downgradient exists between the Upper and Lower Sand aquifers. This would also increase concerns about creation of a downgradient under the landfill itself.

Alternative 8d would require the equivalent of an NPDES permit, but is not considered reliable for the cold climate at the Site.

I. Cost

1. Alternative 1 has a capital cost for monitoring of $70,000 plus a present worth (PW) of operations and maintenance (O & M) of $647,529 for a total PW of $717,529.

2. Alternative 2 costs are as follows:

Type of Cap	Capital Cost of Cap	PW of O & M of Cap	Total PW of cap	Total PW including monitoring (alternative 1)
a. Cap meeting MPCA Standards	$ 4,697,280	235,673	4,932,953	5,650,482
b. Cap Exceeding MPCA Standards	9,101,736	235,673	9,337,409	10,054,938
c. Soil RCRA Cap	12,709,760	235,673	12,945,433	13,662,962
d. Synthetic Liner RCRA Cap	12,652,220	820,107	13,472,327	14,189,856
e. Composite RCRA Cap	19,119,365	235,673	19,355,038	20,072,567
f. Lime - sludge RCRA Cap	8,196,500	235,673	8,432,173	9,149,702

(The Pit was also considered alone. However, since the Pit was found to have several feet of clay capping already, no additional cap was needed. Had the clay not been there, a less permeable cap might have been needed for the asphalt-lined Pit to keep water from accumulating in the Pit.)

3. Estimated costs for alternative 3 are as follows:

a. For the Landfill (must also add alternative cap cost):

Type of System	Capital Cost of System	PW of O & M of System	Total PW of System
i) Groundwater Cut-off Wall with collection drain	$ 5,238,996	123,753	5,362,749
ii) Groundwater Cut-off Wall with	4,770,976	123,753	4,894,729

extraction well

b. For the Pit:

i) Wall with drain	389,536	86,308	475,844
ii) Wall with well	302,723	86,308	389,031

4. Estimate costs for alternative 4 are as follows:

a. For the Landfill (must also add cap cost):

i) Groundwater Pumping with Extraction well	812,000	41,478	853,478
ii) Leachate collection	1,452,500	41,478	1,493,978

b. For the Pit:

i) Well	127,120	90,498	217,618
ii) Drain	201,495	51,376	252,871

5. Estimated costs for alternative 5 are as follows:

a. Excavation and Off-site Landfill			
i) Emelle, Alabama	2,810,851	37,708	2,848,559
ii) Chicago, Illinois	1,963,851	37,708	2,001,559
b. Excavation and On-site Landfill	645,051	37,708	682,759
c. Excavation and On-site Incineration	6,275,851	37,708	6,313,559

6. Estimated costs for alternative 6 are as follows:

a. Excavation and Off-site Disposal with Groundwater Pumping			
i) Emelle, Alabama	2,935,171	41,478	2,976,649
ii) Chicago, Illinois	2,088,171	41,478	2,129,649
b. Excavation and On-site Disposal with Groundwater Pumping	744,171	41,478	785,649

7. Estimate costs for <u>alternative 7</u> (ground water treatment) are as follows:

a. For the Landfill

i) Carbon Adsorption

*) Ground water pumping	91,000	470,138	561,138
**) Ground water pumping within cut-off wall	91,000	355,295	446,295
ii) Air Stripping	84,000	263,953	347,953

b. For the Pit

i) Carbon Adsorption

*) Ground water pumping	91,000	162,319	253,319
**) Ground water pumping within cut-off wall	91,000	44,670	135,670
ii) Air Stripping	84,000	44,306	128,306

8. Alternative 8 (ground water disposal) estimated costs are as follows:

a. For the Landfill

i) Coon Creek	28,700	381,789	410,489
ii) Sewage Treatment Plant	413,280	488,125	901,405
iii) Infiltration Pond	256,500	245,099	501,599
iv) Irrigation	322,000	324,285	646,285

b. For the Pit

i) Coon Creek	28,000	362,936	390,936
ii) Sewage Treatment Plant	371,280	265,160	636,440
iii) Infiltration Pond	97,500	245,099	342,599
iv) Irrigation	189,000	324,285	513,712

J. <u>Community Acceptance</u>

The community has been involved in the planning process as described later in Section XI. Information in the RI assisted in the lifting of a well advisory by the Minnesota Department of Health. Initially removal of the Pit was considered desirable. However, as discovered during the RI/FS investigation of the site, there are hazards involved in excavation and the benefits are not as great as originally thought, considering industrial wastes have been disposed throughout the landfill, not just in the Pit. Presently, there is concern that sewer capacity, and therefore growth, is adversely affected if extracted ground water is discharged to the sanitary sewer. The timeliness of the process has also been questioned.

K. State Acceptance

The MPCA has approved the Detailed Analysis Report, as modified under the Consent Order. That report, as modified, includes the selected alternatives described herein as its recommended alternative.

L. Overall Protection of Human Health and the Environment

1. Ability to Meet the Response Objectives Listed in V.A., Above:

a. No Action (alternative 1). This alternative provides, through monitoring, information on which the need for response could be made, although the long-term management required to determine when and what response is called for, and the timeliness of such response are concerns. It does not provide protection of any receptor or potential receptor of contaminated releases.

This alternative does not meet any of the listed response objectives.

b. Capping only (alternative 2). A cap would meet objectives 1, 2, and 3 by covering the landfill. Objective 10 would be achieved by vents in the cap. Objective 7 would be met somewhat by the bulk and weight of the cap. Over the long-term a cap would reduce contaminant releases to the Upper Sand aquifer (partially addressing objective 4) by reducing infiltration through the landfill. Reduced contaminant releases to the Upper Sand aquifer would reduce Coon Creek releases (partially meeting objective 5). Objectives 6, 8 and 9 are not met by this alternative.

Capping alternatives vary mainly in the amount of infiltration they allow into the landfill.

c. Groundwater Cut-Off Wall with Cap and Groundwater Extraction Well (alternative 3a). This alternative would consist of a cap, a clay cut-off wall around the entire waste area which would be keyed into the till layer, and a ground water extraction well to maintain an inward gradient within the cut-off wall such that in the event of leakage through the wall water would flow into, not out of, the walled area. This alternative would meet all of the objectives of capping (see item b., above). In addition, objective 4 would be met to a greater degree. A major known source area which contributes to the primary contaminant plume in the Upper Sand aquifer would be contained. Objective 5 would be met as the source of contamanents to Coon Creek through the groundwater would be eliminated through containment. For the Pit, a small area, the NAPL would not be allowed to accumulate significantly due to the monitoring/pump-out wells (objective 9 is met for the Pit area only). For the landfill, due to the larger area encircled by the wall, it is possible that NAPL could accumulate along the wall without detection, increasing the probability of contamination of the Lower Sand aquifer (objective 9 is not met). NAPL would not be allowed to migrate along the till away from the walled area which reduces the chances of exposure to the NAPL (objective 8). Objective 6 is not met by this alternative, nor is the maintenance of an upward vertical gradient.

d. Groundwater Cut-off Wall, with Cap and Groundwater Collection Drain (alternative 3b). This is similar to item c., above.

e. Groundwater Pumping with Cap (alternative 4a). This is similar to item c., above, except that objectives 8 and 9 are not met because NAPL would not be contained.

f. Leachate Collection Drain with Cap (alternative 4b). This is similar to item e., above.

g. Excavation and Off-site Disposal of the Pit (alternative 5b). Excavation of the Pit poses the greater risk of significant short-term releases associated with objectives 1, 2, 3, 6, and 7 due to excavation activities and handling of wastes while exposing them to the air. This alternative meets objectives 4, 5 and the NAPL portion of objective 9. Objective 8 is met to the extent that NAPL discharges are eliminated. Objectives 1, 2, 3, 6 and 7 would be met in the long-term after the short-term risks are endured.

h. Excavation and On-site Disposal of the Pit (alternative 5a). This is similar to item g., above, except over the long-term there is a continuing potential for remaining wastes to leak, which would mean objectives 4 and 5 would be met to a lesser degree.

i. Excavation and On-site Incineration (alternative 5c). This is similar to item g., above.

VI. Selecting the Recommended Alternative

The Detailed Analysis Report, prepared by potentially responsible parties in accordance with a Consent Order issued by U.S. EPA and MPCA, recommended implementation of the following alternative response action which, in concert, are expected to reliably and cost-effectively protect public health, welfare and the environment by physically isolating the buried waste to eliminate direct contact exposures and minimize liquid migration; to capture, remove, and treat all contaminated ground water currently leaving the WDE Site and eliminate releases of hazardous substances to receptors; to prevent the migration of NAPL from the Pit area; and to monitor and control gas migration from the Site. The selected remedy consists of:

A. Extensive monitoring program to monitor for gas, dissolved contaminants, and NAPL at the perimeter of the WDE facility.

B. Installation of a soil cap, incorporating the existing lime sludge at the WDE Site as the low permeability layer, which will meet RCRA Performance Standards.

C. Installation of a ground water extraction system along the northern boundary of the facility to intercept contaminated ground water leaving the WDE Site and currently entering Coon Creek.

D. Treatment of contaminated ground water using air stripping and/or activated carbon (possibly with pretreatment for other contaminants). Treated water will be discharged to Coon Creek.

E. Institutional controls to: 1) avoid wells near and under the Site in the Upper Sand aquifer, and; 2) as a precautionary measure to be considered to limit additional wells in the Lower Sand aquifer near the Site to help assure continued maintenance of the upward vertical gradient between the Upper and Lower Sand aquifers.

The Detailed Analysis Report was approved with modifications by the MPCA and U.S. EPA. The most significant modification was to add another component to the set of response action alternatives recommended in the DAR. The additional response action involves the installation of a slurry wall around the Pit (keyed into the red-brown silt till) and a separate ground water pump-out and NAPL control system exclusively for the Pit. In addition, the cap is upgraded to be more in conformance with RCRA technical guidance standards. Thirdly, a geophysical survey will be conducted to better design the NAPL monitoring network. Fourthly, the overall gas and ground water monitoring network is upgraded to cover the perimeter of the WDE Site. Finally, a wetland between the WDE facility and Coon Creek will be filled because it does receive periodic leachate discharges and will be replaced with a newly constructed wetland.

The recommended alternatives, in concert, deal with the WDE Site as a whole because of the size of the former facility (up to 40 feet of wastes over 73 acres), the disperse nature of concentrated sources of hazardous waste (known and unknown "hot spots"), and the deteriorating condition of the present site cover. Much attention was focused upon excavating the Pit because its location is well defined and it is clearly having a significant current impact on ground water and Coon Creek. However, the Pit represents 10% of the hazardous wastes disposed at the Landfill so excavation of the remaining wastes from the Pit would not make a significant difference in the long-term when looking at the site as a whole. The concentration of wastes in the Pit, including acids, caustics, cyanides, flammables, and solvents, does pose a severe safety risk to workers and the surrounding residential areas due to reactions of incompatibles. A test excavation of the Pit conducted in June, 1986, indicated that many of the wastes are in deteriorated containers or have already been released from ruptured containers. Many of the reactives are in plastic containers and are extremely difficult to locate by detecting equipment or excavation equipment. Even if wastes were excavated successfully from the Pit, some wastes will be extremely difficult, if not impossible, to dispose in the near future and this situation is aggravated even more by the implementation of RCRA amendments, including the "land ban," which prohibits land-filling certain types of wastes. The costs for excavation of the Pit and disposal are estimated to range from $ 0.7 to 6.3 million dollars, depending upon the disposal method (on-site land disposal, off-site land disposal, incinerators). Since landfilling the excavated wastes (on-site or off-site) may not be implementable due to land ban considerations, the $6.3 million for on-site incineration is probably the more realistic cost estimate for disposing the excavated wastes. Also, off-site land disposal is the least preferred option for dealing with these wastes per Section 121 of CERCLA. Even with the excavation of the Pit, response actions for the entire WDE Site (adequate cap, ground water extraction and treatment system, gas monitoring, ground water monitoring, NAPL monitoring) are necessary, in large part due to the disperse and unknown pattern of past waste disposal. Containment of Pit wastes, in combination with the other response actions, will accomplish the same overall objectives as excavation of the Pit. Excavation of the pit would only eliminate the need for a slurry wall about the Pit. Because of the obvious safety concerns, disposal difficulties with excavated wastes, high cost ($6.3 million), and remaining need for other response actions, the effectiveness of excavation is minimal. However, some control of the release from the Pit would be effective in reducing the existing impact on Coon Creek and mitigate any NAPL releases that may occur. A slurry wall around the Pit, with its own ground water extraction system and NAPL monitoring/extraction system, will minimize the continued release beyond the Pit and will avoid the severe safety risks and disposal problems faced with excavation.

A wide variety of capping alternatives were evaluated. The fact that the site is a former, but recently active landfill, necessitates the use of flexible, self-healing caps to cope with differential settlement. This condition rules out the use of non-flexible covers (cement, asphaltic - concrete, soil admixtures). The fact that hazardous wastes were disposed at the Site throughout the landfill justified the need for a cap meeting RCRA requirements, thus ruling out conventional landfill caps. However, the presence of up to 8 feet of lime sludge over the Site poses difficulties in placing a new RCRA cap. Removal of the lime sludge would result in a disposal problem of the lime sludge and potentially expose waste. On the other hand, the lime sludge has very low hydraulic conductivity (10^{-5} to 10^{-6} cm/sec) and excellent self-healing properties. There is a tremendous advantage to incorporating the lime sludge into a RCRA design cap. The cap will consist of a minimum of 36 inches of stabilized lime sludge, overlain by a 12-inch sand lateral drainage layer, overlain by a 30-inch layer of general fill, and completed with a 6-inch layer of topsoil that would be vegetated (see Attachment 17). The Remedial Design will incorporate some adjustments in surface slope, slope of drainage layer, grain size of fill, and thickness of lime sludge in order to meet RCRA performance standards.

The cap will completely cover the presently defined limits of waste disposal (73 acres) and will incorporate the existing lime sludge that would otherwise have to be disposed. It will minimize the migration of liquids, provide excellent rodent/vector control, eliminate exposed wastes and leachate seeps. The fact that there are wastes below the water table and liquid wastes (bulk and containerized) were disposed throughout the landfill necessitate the need for extensive ground water extraction and treatment which, in turn, may provide some flexibility in cap design and performance.

As noted earlier, ground water in the Upper Sand aquifer is seriously contaminated and is entering Coon Creek, adversely affecting the quality of Coon Creek. Wastes are disposed below the water table and liquid wastes (bulk and containerized) and sludges were dumped throughout the landfill. Although the most serious contamination detected to date is associated with the Pit, monitoring wells located within the landfill have identified other, scattered "hot spots". There are certainly expected to be many more, unidentified and unlocated hot spots buried in up to 40 feet of wastes. Because it is impractical to locate and control all potential hot spots, an overall site, ground water remedy is required.

The ground water extraction system is the only effective means of preventing contaminated ground water from entering Coon Creek. The use of a drain system is not as effective as extraction wells (particularly for potential NAPL), more difficult and costly to install, and more prone to deterioration and failure than extraction wells. Wells can be installed quickly and easily, have a proven reliability, are easily repaired or replaced if they do fail, can be easily adjusted in terms of performance, and do not pose the risk of encountering wastes that exists with trenching a drain system.

Not only will the ground water extraction system prevent contaminated ground water from entering Coon Creek, it will also increase the difference of hydraulic potential between the Lower Sand aquifer and Upper Sand aquifer and enhance the upward gradient, further minimizing the potential for contaminants to migrate downward.

Excavation of the Pit has already been discussed. Excavation of the entire landfill (over 2.5 million cubic yards of wastes) was viewed as impracticable for lack of disposal options, extremely costly ($48 million for excavation alone), and extremely hazardous due to scattered presence of the equivalence of 60,000 to 100,000 barrels of hazardous wastes plus unknown quantities of other special wastes or infectious wastes.

VII. Recommended Alternative

A. Description

In order to control and prevent all existing releases from the Site (Coon Creek discharge, leachate seeps, exposed wastes) and potential future releases (ground water contaminant migration, NAPL generation/migration, gas migration), a number of different remedial alternatives are necessary. The alternatives include ground water extraction from the Upper Sand for the entire Site, air stripping/carbon treatment of the contaminated ground water and likely discharge under an NPDES permit, slurry wall around the Pit with its own ground water extraction system and NAPL monitoring system, and a cap over the entire Site incorporating the existing lime sludge covering the Site and meeting RCRA requirements, and long-term monitoring of the Upper Sand and Lower Sand aquifers.

The ground water extraction system will consist of six eight-inch wells, screened throughout the entire saturated thickness of the Upper Sand, pumping approximately 10 gallons per minute continuously, and located between the landfill and Coon Creek (see Attachment 18). The extraction system will effectively intercept all contaminated ground water migrating from the Site in the Upper Sand aquifer and currently entering Coon Creek. The ground water removed by the system would be treated, using air stripping or activated carbon or both depending upon the actual hydraulic and chemical loadings and NPDES limitations (other pretreatment may be necessary). The preferred discharge would be to Coon Creek meeting NPDES permit requirements. Final decisions on the treatment and disposal options must await detailed design, pilot testing, and permit requirements. The extraction system will be active indefinitely, and will greatly reduce, if not eliminate, any loadings to Coon Creek and prevent contamination of those private wells north of Coon Creek. Normally, ground water remedial systems are active until all ground water that is moving beyond a Site boundary, at the very least, meets drinking water standards. The ground water in the Upper Sand is so severely contaminated and the releases will be ongoing from scattered sources in the Site for an indefinite period, precluding any chance of shutting down the system within a projected time frame.

The Pit is the current major source of contaminant loading to the Upper Sand aquifer and to Coon Creek. The Pit also has the highest potential for NAPL generation, although no NAPL has been clearly detected to date. In order to provide confinement of any potential NAPL that might be released and maximize removal of heavily-contaminated ground water, a slurry wall will be installed completely around the Pit (Attachment 19) and keyed into the existing red-brown till. The slurry wall will be a soil-bentenite mixture, at least 2 feet thick, having a conductivity less than $1x10^{-7}$ cm/sec. The slurry wall is designed to trap releases from the Pit for recovery via the extraction well, manhole pumpout, and NAPL recovery wells. An 8-inch extraction well will be installed on the upgradient end of the area enclosed by the slurry wall, will pump an estimated 90 gallons/day to maintain a lower piezometric level within the slurry wall and an inward gradient across the slurry wall. Maintaining the inward gradient will minimize the migration of dissolved contaminants across the slurry wall. Extracted groundwater will be treated with the rest of the boundary groundwater extraction system.

The extraction well will be screened about 10-15 feet below the water table. The existing manhole is completed to the bottom of the Pit. Any liquids detected in the manhole will be pumped out to minimize liquid releases from the Pit. NAPL monitoring wells (4 well nests of paired wells) will be located outside the Pit but within the slurry wall. The wells will be equiped with sumps for NAPL detection and recovery. One well of each pair will be completed at the top of the gray till and the other well at the top of the red till. Any NAPL will be recovered using these wells (see Attachment 20).

The cap over the entire site will consist of lime sludge that largely covers the 73-acre site already. The lime sludge has a hydraulic conductivity on the order of 10^{-5} to 10^{-6} cm/sec. The intent is to meet RCRA performance standards. The lime sludge will be graded, stabilized, and compacted to achieve a thickness of at least 3 feet, overlain by a 12 inch sand drainage layer (hydraulic conductivity of greater than 10^{-3} cm/sec.), a geotextile filter fabric, 30 inches of fill, and 6 inches of topsoil with a grass vegetation cover. The surface slope will be at least 3.5 percent. Altogether, 48 inches of fill will cover the lime sludge zone. The lime sludge is self-healing when it does not become dessicated; which is the condition currently existing in portions of the Site. The 48 inches of cover over the lime sludge will maintain adequate moisture to maintain the lime sludge (just like a clay layer), will prevent erosion of the fine grain lime sludge, and will provide protection from frost heaving. The Remedial Design will require further permeability testing, and adjustments to surface slope, slope of drainage layer, grain size of fill, and thickness of lime sludge in order to meet the RCRA performance standards. Institutional controls (deed restrictions) will be required to prevent installation of drinking water wells or other action which could jeopardize the integrity of the cap.

Gas generation and migration (both for methane and for specific volatile organics) has been documented, particularly west of the landfill. Gas vents will be installed below the lime sludge layer through to the surface. The gas vents will be fitted with granular activated carbon filters to remove organic contaminants (see Attachment 21).

In order to monitor the effectiveness of the response actions and to ensure contaminants do not migrate into Coon Creek, beyond Coon Creek in the Upper Sand aquifer, into the Lower Sand and gas does not migrate in the unsaturated zone, an extensive array of gas probes, ground water monitoring wells in the Lower Sand aquifer and Upper Sand aquifer, NAPL monitoring wells in the Upper Sand aquifer, the manhole in the Pit, and sampling points in Coon Creek will be monitored. Any Coon Creek discharges would be monitored as part of NPDES permit requirements. Monitoring stations will be located on all sides of and within the landfill and will include approximately 28 ground water monitoring wells, 10 NAPL monitoring wells, 3 surface water stations, 10 gas probes, the manhole in the Pit, and selected, but as yet, undetermined number of private wells (see Attachment 21). The monitoring system will assess the effectiveness of the response actions already discussed and will monitor all routes of current releases (Pit release towards Coon Creek and potential releases of NAPL).

In order to enhance the monitoring network for NAPL migration beyond the Site) to deal with the concern of multiple, unlocated sources - "hot spots"), geophysical surveys will be conducted along the perimeter of the landfill (500-foot radius about the landfill) in order to identify low areas in the till for placement of NAPL monitoring wells.

A related response action involves filling wetland areas between the landfill and Coon Creek because they do receive seepage intermittently from the Site. In order to discourage migrating water fowl and other wildlife from inhabiting this area, the wetlands will be filled in accordance with applicable U.S. Army Corps of Engineering (COE) and U.S. Fish and Wildlife

Service (FWL) requirements, including mitigation. The actual location(s) of any new wetlands must be negotiated between the City of Andover, Anoka County, the Minnesota Department of Natural Resources, MPCA, FWL, COE and U.S. EPA.

B. Costs

The costs of the recommended alternatives for response actions are broken down into capital costs (generally construction or requisition costs), operation and maintenance costs, and a total present worth cost (10 percent discount rate and 30 year life).

The costs are delineated for each component of the response action as follows:

	Capital Costs	Present Worth O & M	Total Present Worth
Capping of Site	$8,196,500	$235,673	$8,432,173
Ground Water Extraction			
Construction	812,000	41,478	853,478
Treatment			
Carbon Treatment	91,000	470,138	561,138
Air Stripping	84,000	44,306	128,306
Disposal			
Coon Creek NPDES	28,700	381,789	410,489
Slurry Wall With Extraction Well	302,723	86,308	389,031
Site Monitoring	70,000	647,529	717,529
Filling of Wetland	3,837	-0-	3,837
Total	9,504,796	1,862,915	11,367,675

(for carbon treatment and Coon Creek disposal)

VII. Applicable or Relevant and Appropriate Requirements

A. General Discussion

Section 121(d) of SARA requires that remedial actions comply with legally applicable or relevant and appropriate requirements (ARARs) of Federal environmental laws and more stringent, promulaged State laws.

"Applicable" requirements are cleanup standards, standards of control and other substantive environmental protection requirements, criteria or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant contaminant, remedial action, location or other circumstance at a site. A requirement is "applicable" if the remedial action or circumstances at the site satisfy all the jurisdictional prerequisites of the requirement. "Revelant and appropriate" requirements are cleanup standards, standards of control and other environmental protection requirements, criteria or limitations promulgated under Federal or State law that, while not "applicable" to the remedial action or circumstances at the site, address problems or situations sufficiently similar to those encountered at the site that their use is well suited to the remedial action at the site.

Non-promulgated advisories or guidance documents issued by Federal or State governments do not have the status of potential ARARs; however, where ARARs do not exist, or for some reason may not be sufficiently protective, non-promulgated advisories or guidance documents may be considered in determining the necessary level of cleanup for protection of human health and the environment. See Interim Guidance on Compliance with Applicable or Relevant and Appropriate Requirements dated July 9, 1987. State of Minnesota Recommended Allowable Limits (RALs) fall into this category.

This section identifies the requirements of environmental laws, regulations and polices that are applicable or relevant and appropriate standards for the recommended alternative for remediating the site.

Ground water protection standards have been established under RCRA, at 40 CFR Section 264.94. RCRA regulations apply to facilities treating, storing and disposing of hazardous waste as of November 19, 1980. Such facilities were required to apply for an operating permit by that date. Such facilities are further required under Section 3004(u) of RCRA and 40 CFR 264.101 to institute "corrective action" as set forth in the permit, to remedy releases of hazardous waste and constituents from any "solid waste management unit" at the facility. The ground water protection standards at 40 CFR 264.94 are to be established in permits and apply to any solid waste management units which received waste after July 26, 1982. The ground water standards serve both as a trigger for requiring corrective action to remedy a release from such a solid waste management unit, and as clean-up standards for the corrective action. However, because no hazardous waste was placed in this area after July 26, 1982, the ground water protection standards of 40 CFR 264.94 are not "applicable" under RCRA to this solid waste management unit. They may, nevertheless, be "relevant and appropriate" as clean-up standards for this ground water remedial action.

There are three types of standards established under 40 CFR 264.94: Background levels, Listed Maximum Concentration Limits and Alternate Concentration Limits (ACLs). The regulations specify that the standard for concentrations of hazardous constituents in ground water in a facility permit must not exceed the background level or a listed maximum concentration limit or an ACL established by the Regional Administrator.

1. Listed Maximum Contaminant Levels. To date, Maximum Concentration Limits under RCRA have been established for fourteen chemicals. These limits are based on and are identical to the Safe Drinking Water Act MCLs for these chemicals. None of these listed chemicals are contaminants in the ground water at the WDE site.

2. Background Levels. The background level is that level of a chemical in the ground water in an area not impacted by contaminants in the ground water at the WDE site.

3. ACLs. U.S. EPA may establish ACLs in lieu of background levels or listed maximum concentration limits of the ACL "will not pose a substantial present or potential hazard to human health or the environment as long as the [ACL] is not exceeded." 40 CFR 264.94(b).

Standards for specific contaminants have been promulgated under the Safe Drinking Water Act (SDWA) to protect public drinking water systems. Standards set under the SDWA are usually relevant and appropriate when groundwater is being cleaned up at Superfund sites. Since this remedy creates an hydraulic barrier to prevent movement of contaminated groundwater to off-site areas, the remedy would comply with the SDWA and RCRA corrective action requirements. Under RCRA, the point of compliance would be set at the landfill boundary (at groundwater extraction system). The SDWA standards are not ARARs for on-site areas in this case, since institutional controls will prevent any potential use of the contaminated groundwater.

The Federal Clean Water Act (CWA), 33 U.S.C. 1251, et. seq., as amended, requires U.S. EPA to establish water quality criteria for bodies of water, based on effects of pollutants on human health and aquatic life. 33 U.S.C. 1314. Section 121 of CERCLA states that remedial actions shall attain these water quality criteria where they are relevant and appropriate under the circumstances of the release, based on the usage or potential usage of the water receiving the release. By eliminating contaminated groundwater discharges the selected remedy will assure continued maintenance of these criteria in Coon Creek and should result in attainment of these criteria in the groundwater north of Coon Creek (methylene chloride presently exceeds criteria. The existing concentration of contaminants in Coon Creek should be brought well below the 10^{-6} risk levels and other freshwater criteria established under the CWA.

The Federal Clean Water Act limits construction activities in floodplains and wetland through Section 404. The Army Corps of of Engineers administers these requirements through permits. Since the proposed response action will involve construction of a cap in the floodplain and the filling of wetlands, compliance with applicable permit requirements established by the COE, FWL and U.S. EPA, including mitigation, is appropriate.

The Federal Clean Water Act limits discharges to waterways. Individual discharges are regulated through National Pollutant Discharge Elimination System (NPDES) permits. (40 CFR Part 122) the State administered water quality program is substantially equivalent to the Federal NPDES requirements. The discharge limits established in the NPDES permit process are designed to preserve the present use designation of the receiving waters and potential downstream uses. Coon Creek is currently designated as a partial body contact, warm water fishery. The NPDES regulations are an ARAR for effluent from Superfund site treatment plants which discharge offsite. Water quality-based NPDES permit limits will be based in part on stream criteria and may include more stringent limits or whole effluent toxicity limits to protect against interactive effect of toxicants. NPDES permit limitations will be required for discharges of treated groundwater to Coon Creek.

During the design phase of the project the potential for discharge to the POTW will be examined further. In order to discharge from a Superfund site to a POTW, certain factors must be considered which are identified in a policy memorandum dated April 15, 1986, "Discharge of Wastewater from CERCLA Sites into POTWs" from Henry L. Longest, Director, Office of Emergency and Remedial Response, Rebecca Hanner, Director, Office of Water Enforcement and Permits, and Gene Lucero, Director, Office of Waste Programs Enforcement, to Waste Management Division Directors, Regions I-X. These factors are listed below.

(1) Potential of pollutants to cause pass through or interference, including a health hazard to employees at the POTW.

(2) The ability of the POTW to ensure compliance with applicable treatment standards and requirements.

(3) The POTW's record of compliance with the NPDES permit and pretreatment program requirements.

(4) The potential for volatilization of the wastewater and its impact upon air quality.

(5) The potential for ground water contamination from transport of CERCLA wastewater to the POTW, and the need for ground water monitoring.

(6) The potential effect of the CERCLA wastewaters upon the POTW's discharge into receiving waters.

B. Site Discussion

The overall objective of any response actions are to permanently or significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants, or contaminants. However, dealing with sites on the scale of the WDE Site (equivalent of 60,000 - 100,000 barrels of hazardous wastes within 2.5 million cubic yards of solid waste) is extremely difficult, particularly in regard to reducing the volume and toxicity. Although excavation of the Pit may potentially reduce the volume and toxicity of hazardous substances, the Pit does represent only an estimated 10 percent of the hazardous substances disposed at the Site. The remaining wastes are scattered throughout the landfill. The nature of the Site is such that response actions must deal with the Site in its entirety and, therefore, focus on controlling the mobility of the hazardous substances. The lime sludge cap is designed to isolate the wastes from direct contact, to limit the mobilization of liquids and generation of leachates, and control gas migration. It should meet RCRA performance requirements and will incorporate the existing lime sludge cover at the Site. The cap does satisfy MPCA requirements for general landfill caps and Anoka County requirements for cap closures. This cap will also need to satisfy the State closure requirements for the SW-28 permit issued in 1971.

If the lime sludge cap were not utlized as a cap, the excavation and disposal of the lime sludge will be a significant problem in and of itself, in addition to concerns about exposed wastes and physical hazards.

The ground water extraction system will require carbon treatment and/or air stripping, with a discharge of the treated effluent to Coon Creek. The ground water extraction component is the primary mechanism for eliminating the mobility of hazardous substances from the Site. These hazardous substances are currently impacting Coon Creek and some ground water beyond the creek. The ground water extraction system will prevent contaminants from migrating beyond the northern fringe of the Site, eliminated the contamination in the Creek and beyond the Site. The existing concentrations of contaminants should be brought well below the 10^{-6} risk Water Quality Criteria for contaminants in Coon Creek and below the Maximum Contaminant Levels, Water Quality Criteria, and Minnesota Recommended Allowable Limits for ground water north of the creek.

The air stripper will have to have carbon treatment for the exhaust because some of the volatile organics are considered carcinogenic. Additional treatment trains may need to be evaluated and implemented to meet the objectives of the NPDES permit requirements.

Spent carbon from the air stripper as well as from the carbon treatment of ground water will be handled as a hazardous waste under RCRA regulations.

The discharge from the ground water extraction system will likely go to Coon Creek under an NPDES permit requirements established by the MPCA and with the approval of the Coon Creek Watershed District. Appropriations approval from the Minnesota Department of Natural Resources for the extraction of contaminants will be required. The wells must comply with the Minnesota Water Well Construction Code.

In the event that an NPDES permit requirements cannot be achieved, the option of disposal to the sanitary sewer must be seriously considered. However, the City of Andover has strongly objected to this option and the MWCC has expressed reservations about allowing long-term discharges to the sanitary sewer system because of the relatively dilute wastewater (relatively low solids) and the presence of a wide variety of organics. This Record of Decision will be modified in the event that discharge to the sanitary sewer is recommended as a result of future remedial design activities.

The slurry wall with ground water extraction and NAPL monitoring and extraction for the Pit do not necessarily have any particular rules or regulations that directly apply to the alternative other than those already applicable to the overall ground water extraction system.

The filling of the wetlands (about 2 acres in total) south of Coon Creek will be conducted considering applicable U.S. Army Corps of Engineers requirements and input from the Department of Natural Resources. Mitigation, such as replacement, can be required by FWS, according to CWA, section 404, provisions.

The construction of the new monitoring wells and extraction wells must be in accordance to the Minnesota Water Well Construction Code.

The Respondents agreed in the Consent Order to accomplish the following tasks:

1. Design, initiate and complete the landfill and pit Remedial Investigation/Feasibility Study (RI/FS);
2. Establish a trust fund to pay for the RI/FS work;
3. Establish a $1 million trust fund in the event the Respondents do not implement the remedial actions as selected by the MPCA and U.S. EPA;
4. Design the selected response action for the WDE site designated in the U.S. EPA Record of Decision; and
5. Enter into good faith negotiations leading to an agreement to address remedial and removal actions at the WDE Site.

Under the Consent Order the MPCA and U.S.EPA agreed to:

1. Identify additional potential responsible persons who are not currently parties to the Consent Order;
2. Issue Requests for Response Actions (RFRA's) to additional responsible persons; and
3. Issue Determinations of Inadequate Response (DIR's) to each of the responsible persons who have failed to respond or who respond inadequately.

In partial fulfillment of obligations under the Consent Order, the MPCA issued a RFRA to seven responsible persons in July, 1984. These seven included Melron, Inc. (property owner), Ronald Roth (part owner of Melron, Inc. and operator of the WDE Site), Waste Control, Inc. (WCI-transporter), Art Willman & Sons, Inc. (transporter), Industrial Steel Container (owned or possessed hazardous substances and arranged for their disposal), and Whittaker Corporation (owned or possessed hazardous substances and arranged for their disposal). Each of the parties named as responsible persons in the July, 1984 RFRA failed to take the requested actions and were subsequently issued a DIR in October, 1984.

In April, 1987, the MPCA again issued a RFRA to seven additional responsible persons. These seven included American Can Company, G & K Services, Inc., Gillette Company, H.B. Fuller Company, Minneapolis Electric Steel Castings Division-Evans Product Company, Soo Line Railroad Company and Union Brass and Metal Manufacturing Company. These parties were issued a RFRA because they owned or possessed hazardous substances and arranged for the disposal or transport for disposal of those substances at the WDE Site. Each of these companies have agreed, in writing, to take the requested actions by notifying the MPCA that they intend to negotiate in good faith regarding participation in implementation of remedial action at the WDE Site.

In September, 1987 the MPCA issued a RFRA to twelve additional responsible persons. These twelve included American Hoist and Derrick, Brandtjen and Kluge, Dworsky Barrel, Federal Cartridge Corporation (Federal-Hoffman, Inc.), Foley Manufacturing Company (Foley-Belsaw

IX. Enforcement Status

The WDE Site is located within the city limits of Andover (formerly Grow Township), Anoka County. Prior to 1971, the WDE Site was operated as a solid waste dump for at least nine years. The dump was established by Leonard E. Johnson and was licensed by Grow Township.

The dump was purchased by WDE, Inc. in 1968. A permit to operate as a sanitary landfill was granted by the Grow Township Board effective mid-year, 1968. In 1970, WDE, Inc. submitted a permit application for the MPCA to operate a solid waste disposal system. Included in this application was a proposal to dispose of hazardous substances in a specially constructed trench in the landfill (generally referred to as the "WDE Pit"). On March 30, 1971, the MPCA issued a permit (SW-28) to WDE, Inc. to operate the WDE Site as a solid waste disposal system including construction and operation of the WDE Pit. Approval was also given by Anoka County and the Metropolitan Council.

Construction of the WDE Pit was completed in 1972. The MPCA ordered the WDE Pit closed effective February 1, 1974 due to changes in regulations and because the MPCA determined that a high potential for ground water pollution existed at the WDE Site. That determination was based on the fact that: WDE Inc. submitted inadequate hazardous waste disposal reports, WDE, Inc. did not submit required monitoring results, and investigation indicated that WDE, Inc. did not follow the plans approved by the MPCA for the WDE Pit disposal operations.

WDE, Inc. sent a notification of a Hazardous Waste Site regarding the WDE Site to U.S. EPA in June, 1981 in fulfillment of CERCLA 103(c). Pursuant to section 105(b) of CERCLA, the WDE Site was listed on the National Priorities List by publication in the Federal Register on September 8, 1983, 48 Fed. Reg. 40658-40682 (1983).

The Minnesota Department of Health in January, 1983 issued a drinking water well advisory in portions of the city of Andover due, in part, to hazardous substances disposal at the WDE Site. The well advisory was dropped following the completion of the Remedial Investigation for the Site in October, 1985.

In March, 1984 the MPCA and U.S. EPA entered into a Consent Order with 9 companies. Three more companies joined the group and executed the Consent Order in April, 1984. The twelve companies (known as the "Respondents" in the Consent Order) are Economics Laboratory, Inc., Ford Motor Company, Honeywell, Midland Cooperatives, Inc., Minco products, Onan Corporation, Sperry Corporation (Unisys), Thermo King Corporation, Warden Oil, Control Data Corporation, Cornelius Company, and FMC Corporation.

XI. Community Relations History:

Since 1983, the MPCA and U.S. EPA have been involved in numerous community relations activities associated with the WDE, Inc. Site. The major community ~~relation~~ relations activities include the following:

April 1983	The MPCA conducted community interviews with local officials and interested residents.
May 1983	The MPCA prepared a Community Relations Plan for the anticipated fund-financed Remedial Investigation/Feasibility Study.
Oct. 27,1983	The MPCA issued a news release announcing a public meeting and the beginning of a Superfund project.
November 1983	The MPCA prepared a fact sheet providing background on the Site.
Nov. 10, 1983	The U.S. EPA and MPCA participated in a public meeting at the Andover City Hall and discussed the Superfund project.
Mar. 23, 1984	The U.S. EPA issued a news release announcing that agreement had been reached on the terms of a Consent Order.
June 18, 1984	The MPCA issued a news release announcing a public meeting and the beginning of a responsible party investigation.
June 1984	The MPCA prepared a revised fact sheet providing background and history of the Site.
June 25, 1984	The MPCA sponsored a public meeting at the Andover City Hall to discuss the Consent Order and investigation plans.
Sept. 27, 1985	The MPCA issued a news release announcing a public meeting and completion of a draft Remedial Investigation report.
Oct. 9, 1985	The MPCA sponsored a public meeting on the Remedial Investigation report.
Oct. 25, 1985	The MPCA issued a news release regarding the revised Remedial Investigation report.
Feb. 7, 1986	The MPCA issued a news release regarding the completion of a draft Alternative Reports.
March 10, 1986	Meeting on Alternatives Report held with Anoka County Commissioners and Andover City Council.

Company), Frost Paint and Oil Corporation, Glidden Paint, Mogul Corporation, Northwest Airlines, Pako Corporation, Saxon Industries, Inc. (Paper Corporation of America) and Whirlpool Corporation.

The MPCA and U.S. EPA shall intend to begin negotiations to enter into a Consent Decree with the responsible parties. The major task to be accomplished in the Consent Decree is the implementation of the remedial actions.

X. Operation and Maintenance:

There are many operations in the proposed remedy which must be maintained. These include the following:

A. Operation, maintenance, and monitoring of ground pump-out wells:

1. in a line along the northern perimeter of the site to contain and remove contaminated groundwater, and which will also be beneficial in maintaining the upward gradient between the Upper and Lower Sand aquifers at the Site, and

2. within the slurry wall around the Pit to maintain an inward gradient and to remove contamination if necessary.

B. Operation, maintenance, and monitoring of the extracted ground water treatment system, which is expected to be carbon absorption.

C. Monitoring of the discharge of the collected groundwater, expected to be to Coon Creek in accordance with an NPDES permit.

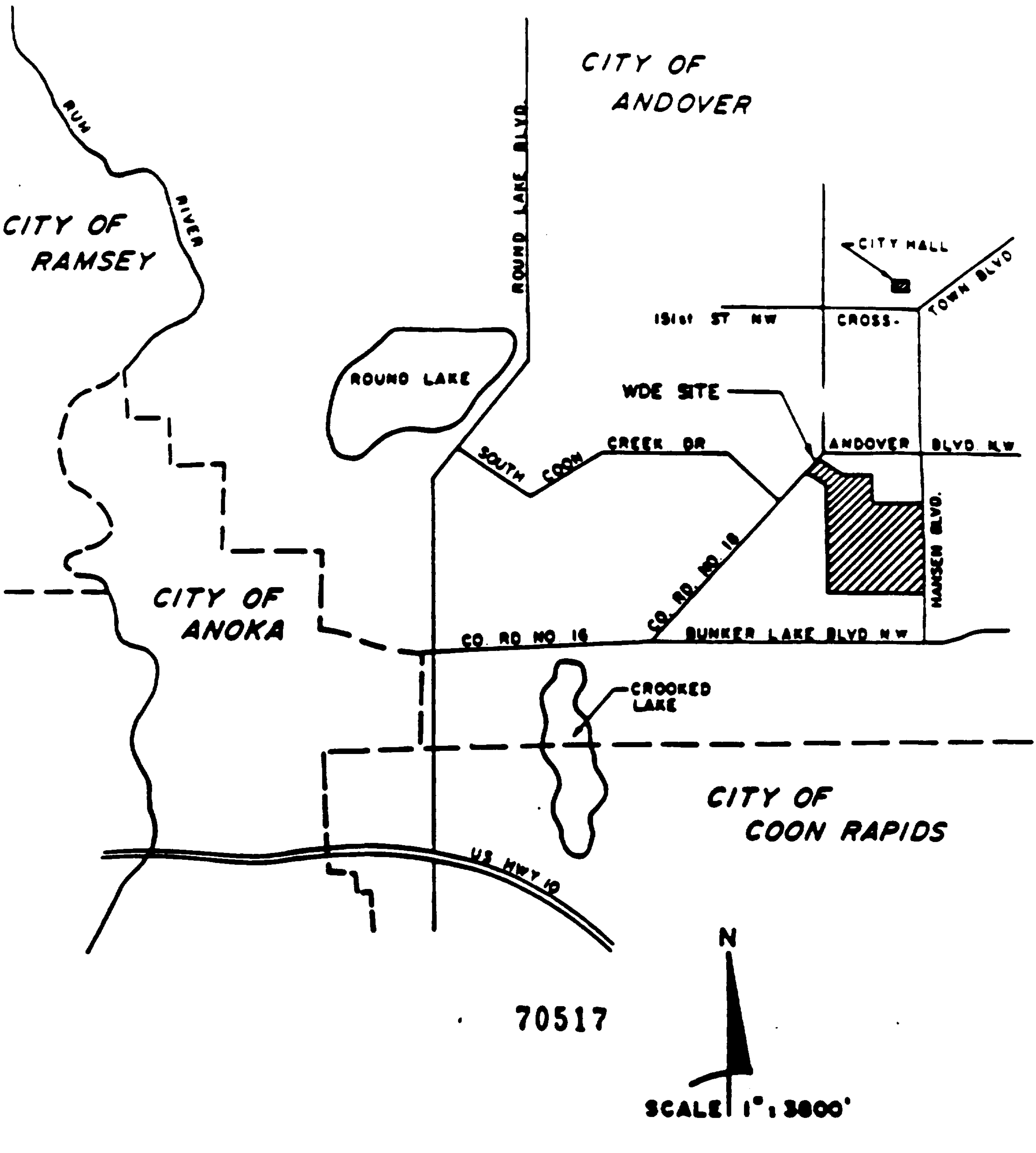
D. Operation, maintenance, and monitoring of the landfill gas vents to avoid gas accumulation under the landfill cap.

E. Maintenance of the landfill cap to maintain a cover over waste materials, to eliminate seeps, to reduce infiltration through waste materials and to prevent use of the underlying groundwater.

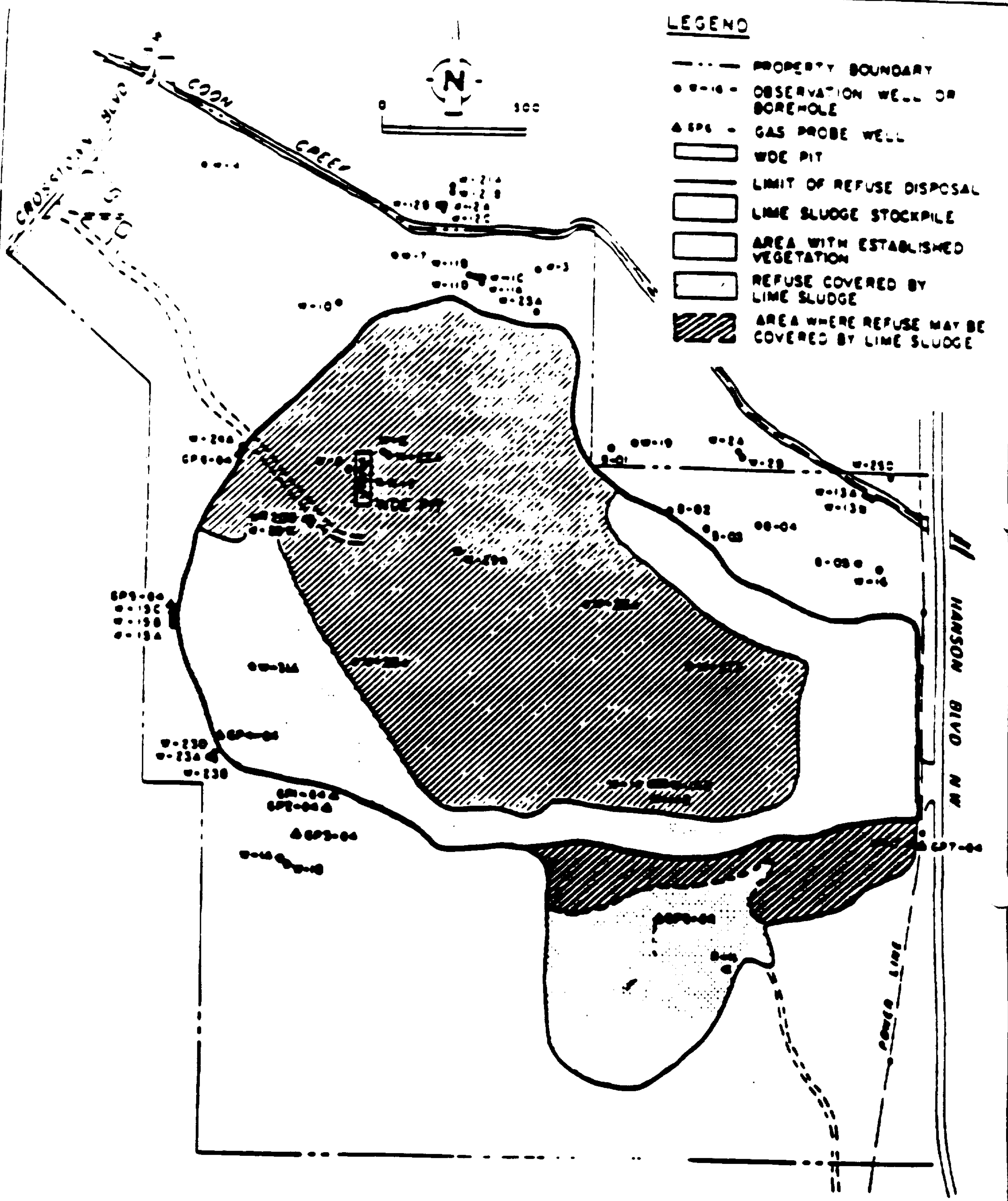
F. Monitoring of ground water, surface water, potential NAPL routes, and gas within the landfill to assure the effectiveness of the response actions.

G. Maintaining institutional controls prohibiting wells in the Upper and Lower Sand aquifers near the Site to avoid use of contaminated water and to maintain a vetical gradient across the red/brown till is being recommended as a precautionary measure. These actions can be implemented by the State through the Minnesota Department of Health, through their approval rights over installation of new drinking water wells.

ATTACHMENT 2
WASTE DISPOSAL ENGINEERING



WDE RI/FS EVALUATION	E.A. HICKOK & ASSOCIATES HYDROLOGISTS · ENGINEERS MINNEAPOLIS · MINNESOTA	APRIL, 1984
LOCATION MAP—REGIONAL AREA		2



ATTACHMENT 3
WASTE DISPOSAL ENGINEERING

figure L2

PLAN OF REFUSE DISPOSAL
WDE, Andover, Minnesota

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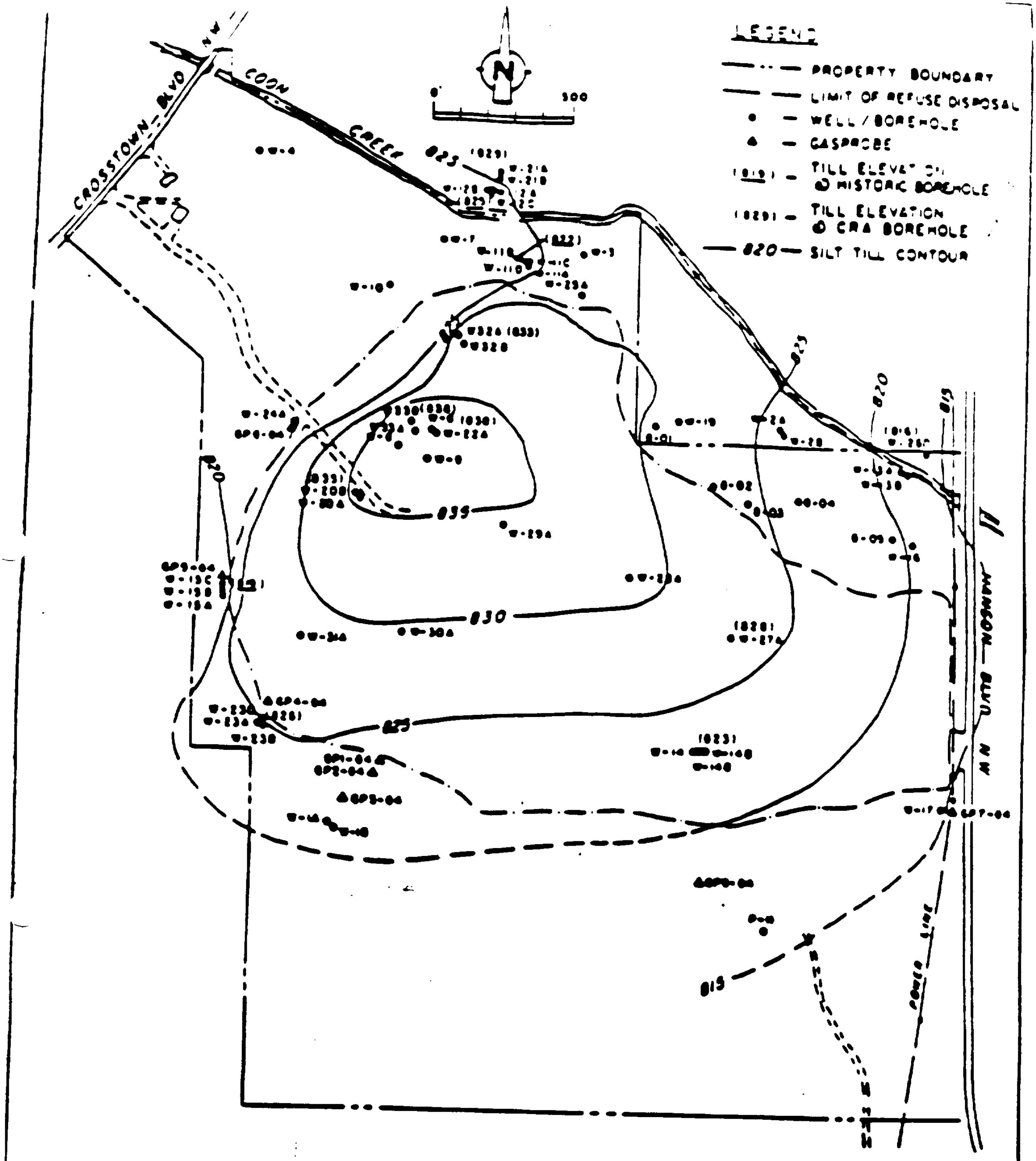


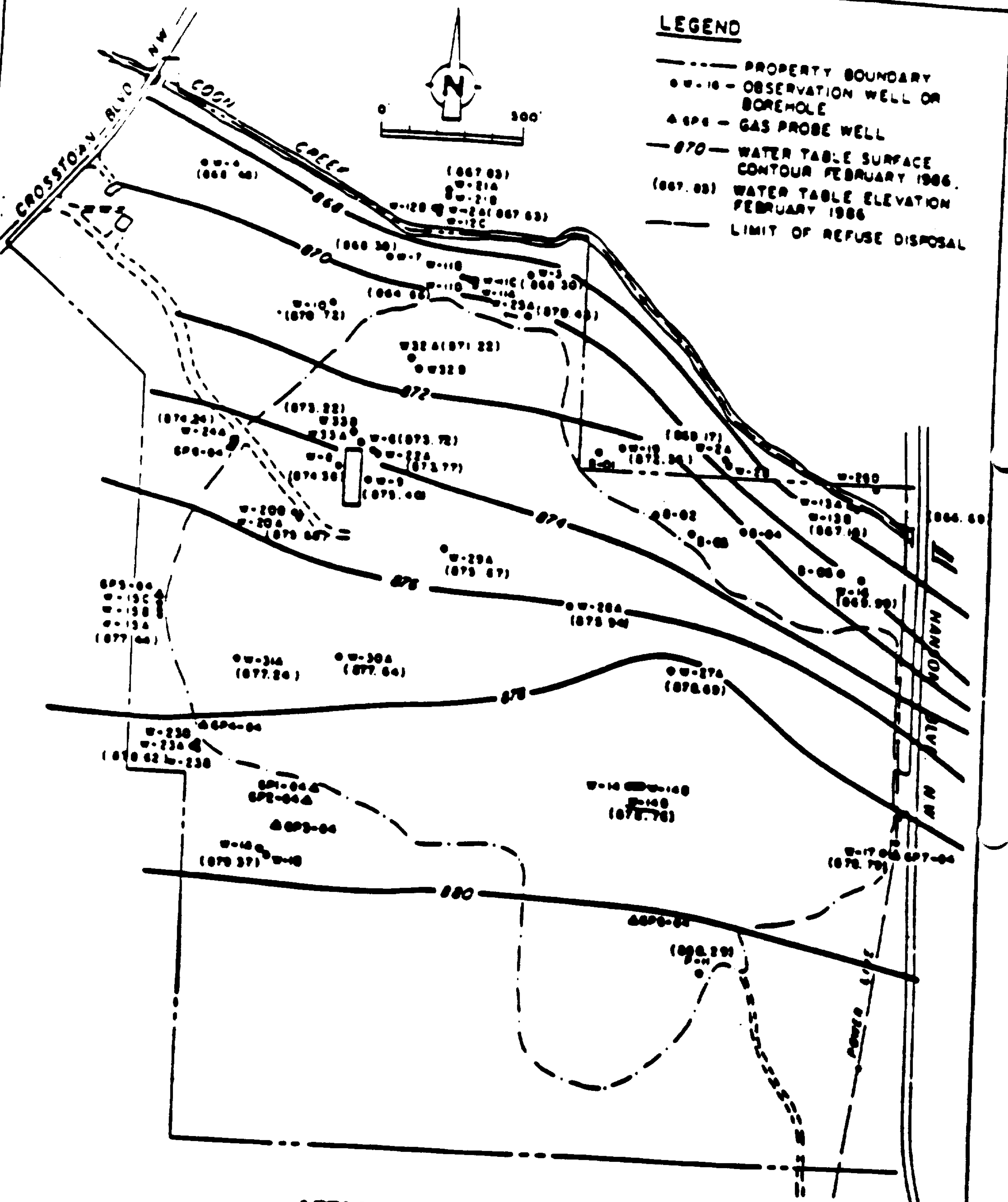
ATTACHMENT 4
WASTE DISPOSAL ENGINEERING

figure 4.13

TOP OF SILT TILL UNIT

WDE, Andover, Minnesota

CRA



ATTACHMENT 5
WASTE DISPOSAL ENGINEERING

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figure 4·21
WATERTABLE CONTOURS
UPPER SAND AQUIFER
WDE, Andover, Minnesota

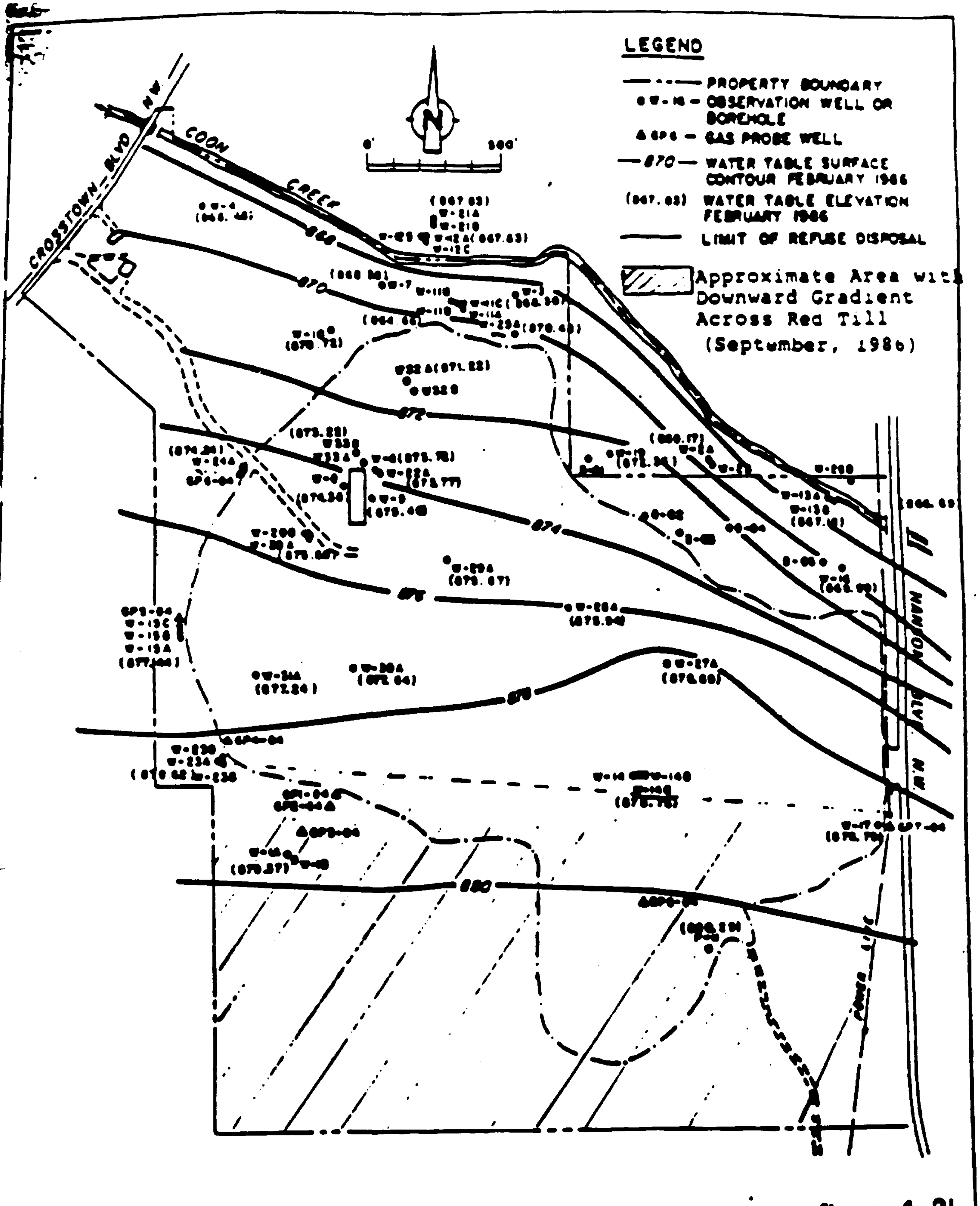

figure 4·21
WATERTABLE CONTOURS
UPPER SAND AQUIFER
WDE, Andover, Minnesota

ATTACHMENT 6
WASTE DISPOSAL ENGINEERING

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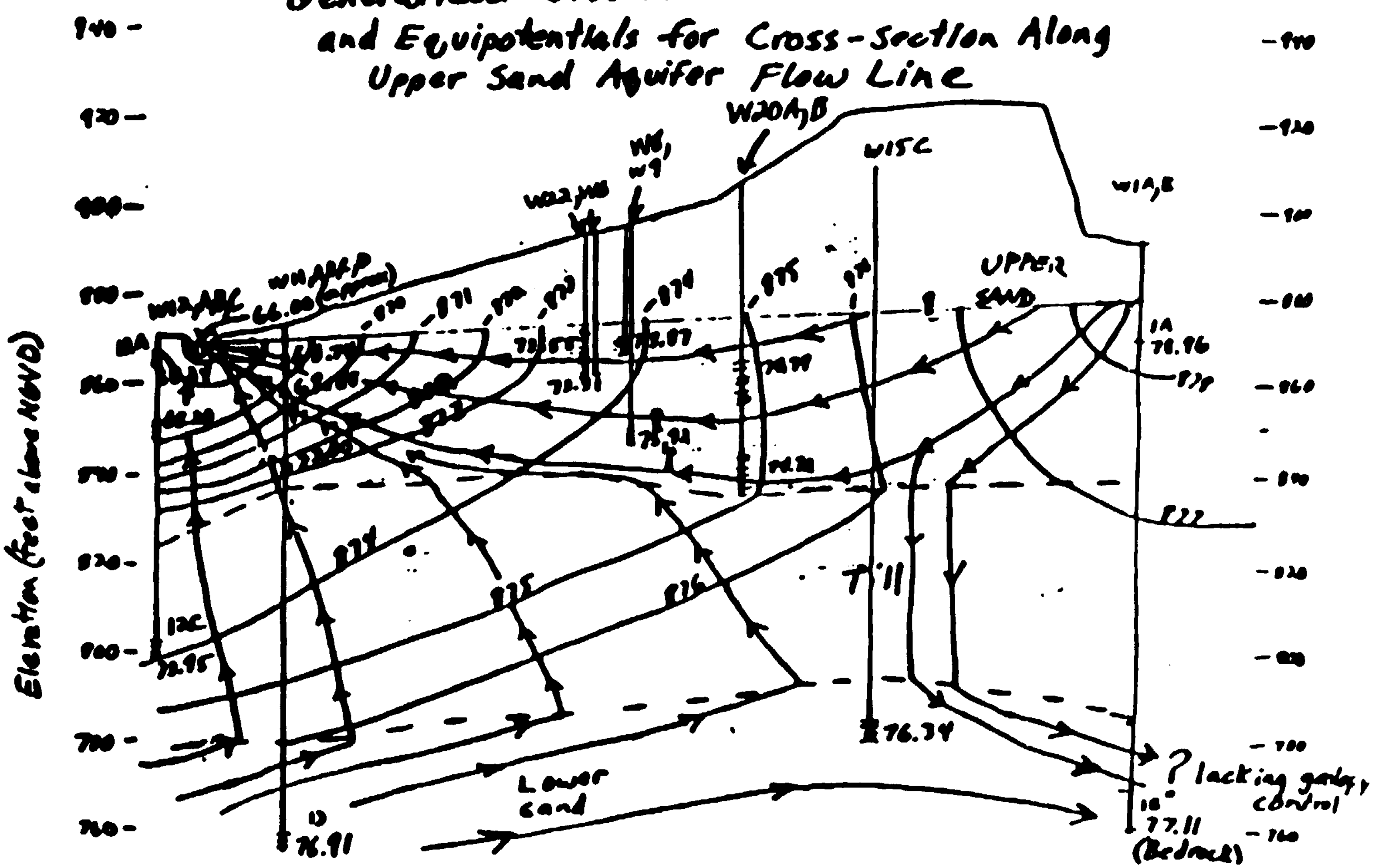
Figure 4: May 27, 1985

Generalized Groundwater Flow Lines and Equipotentials for Cross-Section Along Upper Sand Aquifer Flow Line

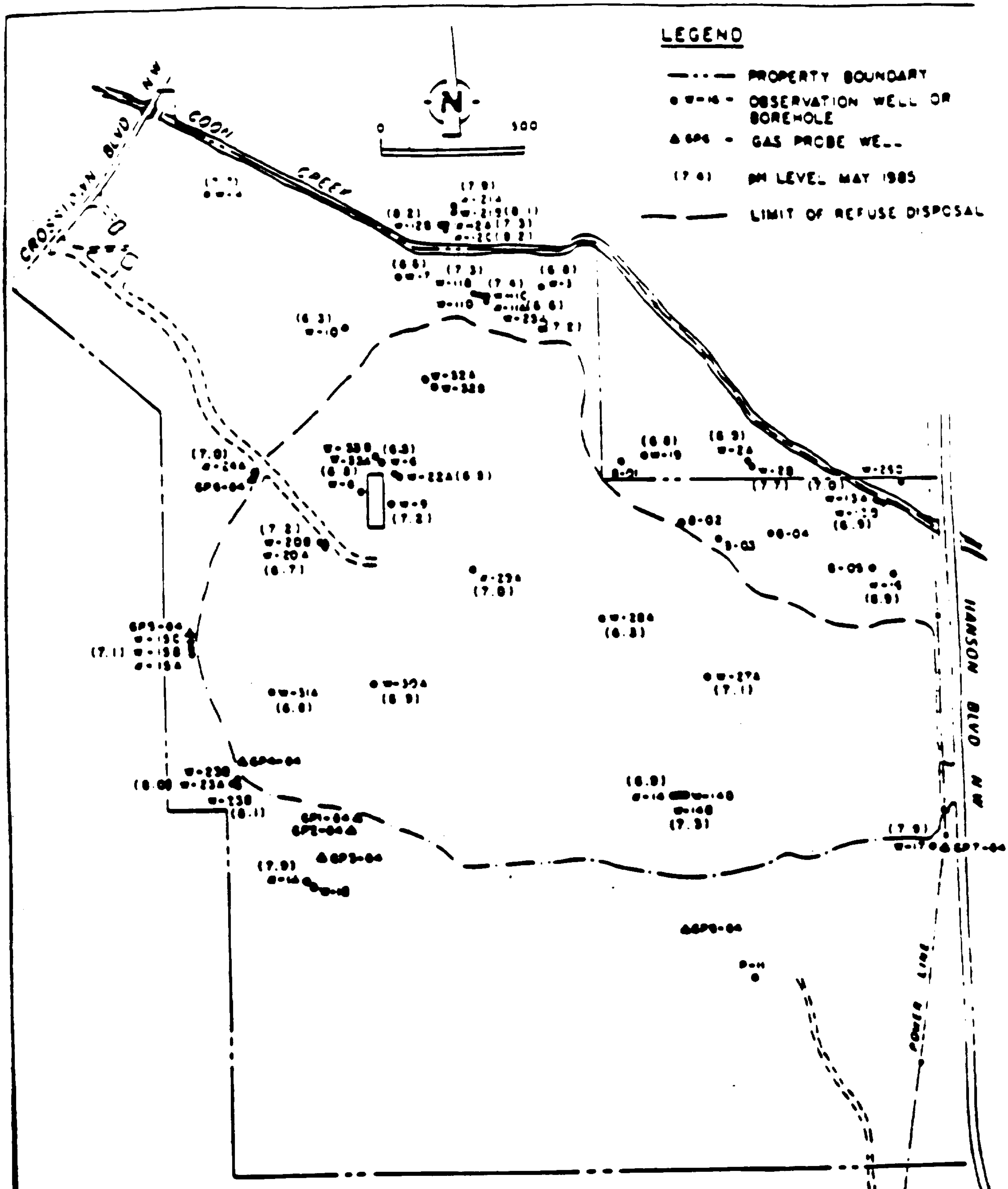


Explanation: ——874—— line of equal hydraulic potential labeled in Feet above NGVD

——→—— generalized line of ground water flow

Notes: Streamline - equipotential line orthogonality not preserved due to large vertical scale exaggeration. Till contacts ▬▬▬ are not accurate, but do not affect general flow pattern as shown.

ATTACHMENT 7
WASTE DISPOSAL ENGINEERING



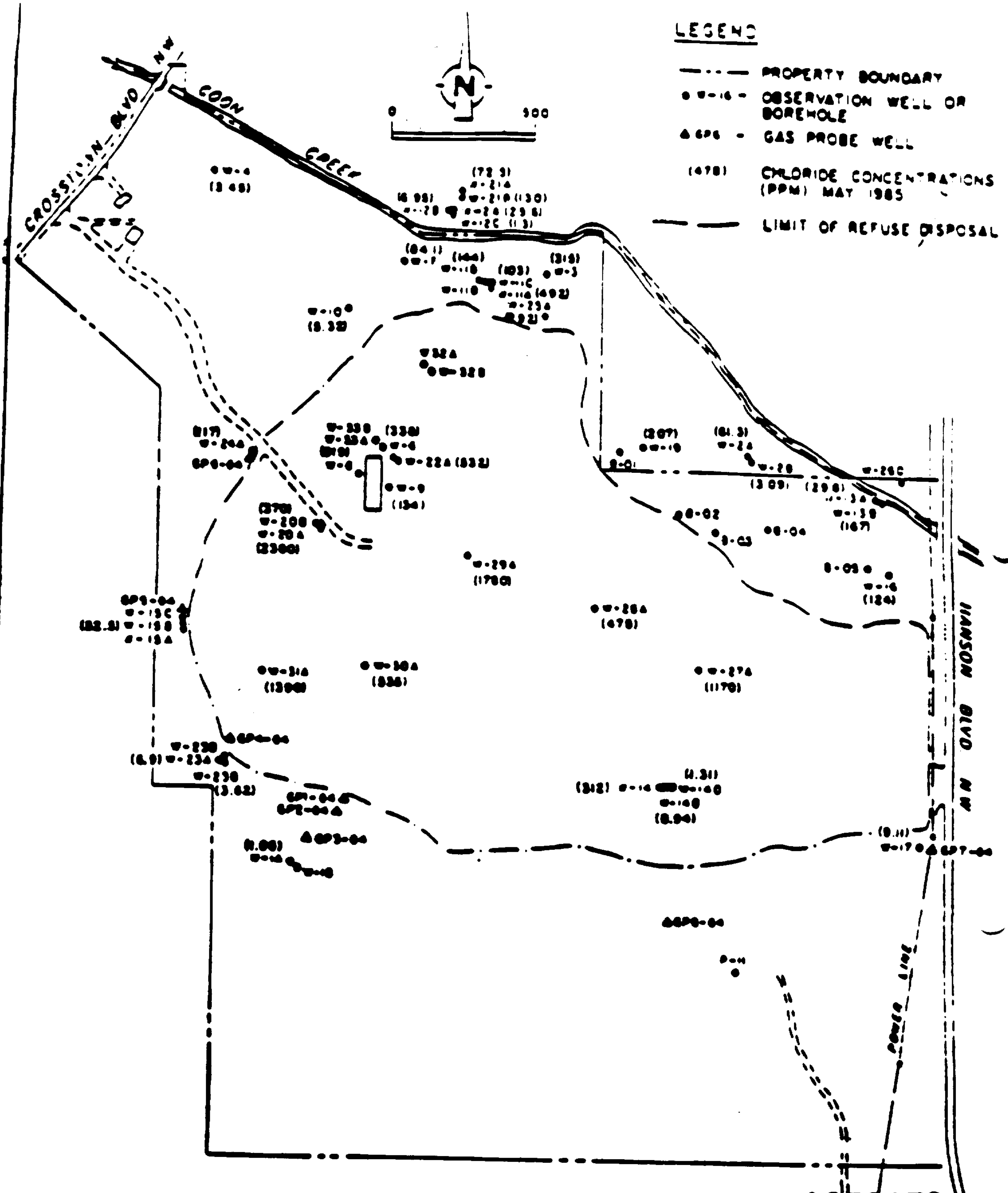
1652343

figure 4.31

ATTACHMENT 8
WASTE DISPOSAL ENGINEERING

pH LEVELS
UPPER SAND AQUIFER
WDE, Andover, Minnesota

CRA



1652350

ATTACHMENT 9
WASTE DISPOSAL ENGINEERING

figure 4.32

CHLORIDE CONCENTRATIONS
UPPER SAND AQUIFER
WDE, Andover, Minnesota

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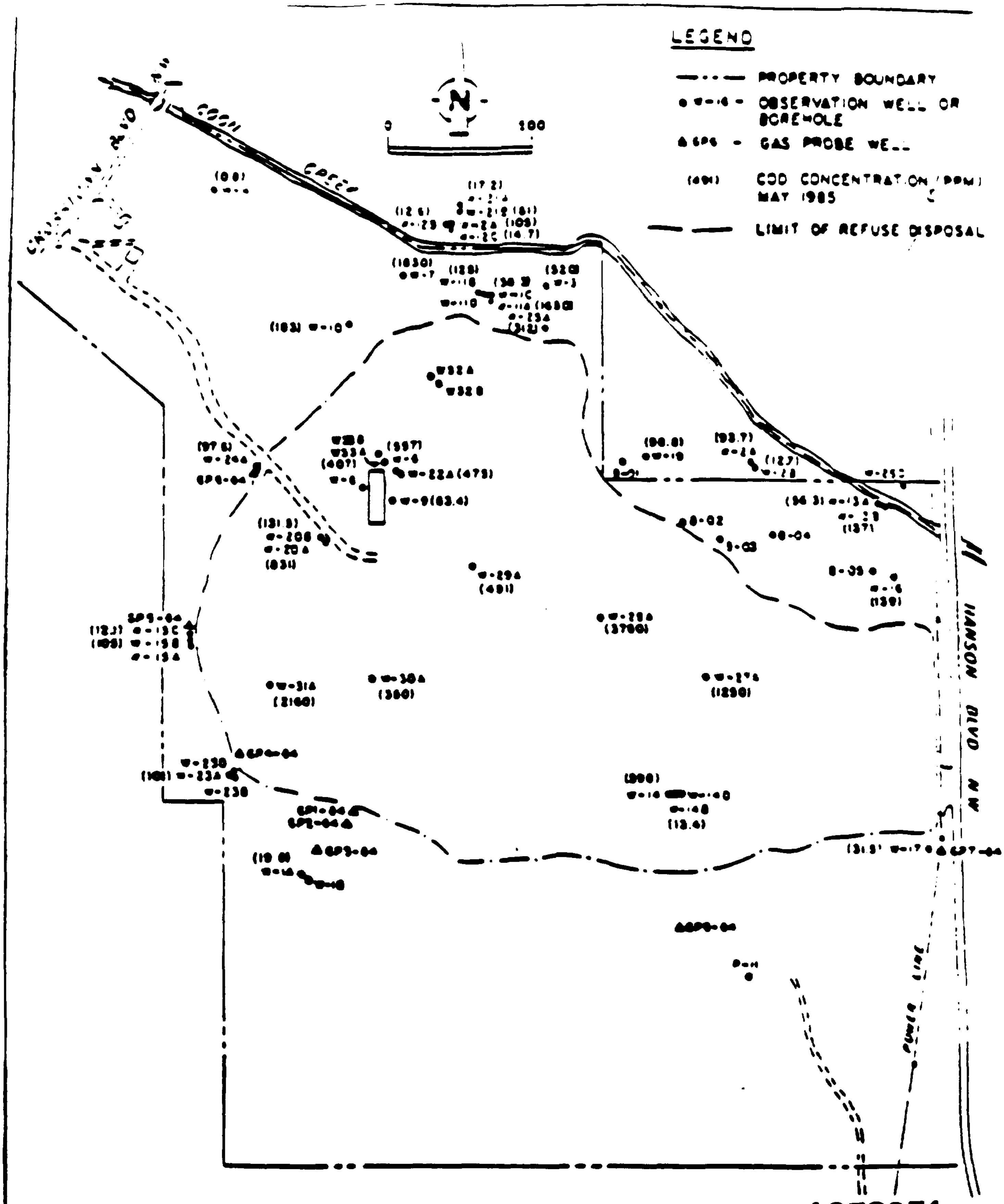

1952351

ATTACHMENT 10
WASTE DISPOSAL ENGINEERING

figure 4.33
COD CONCENTRATIONS
UPPER SAND AQUIFER
WDE, Andover, Minnesota

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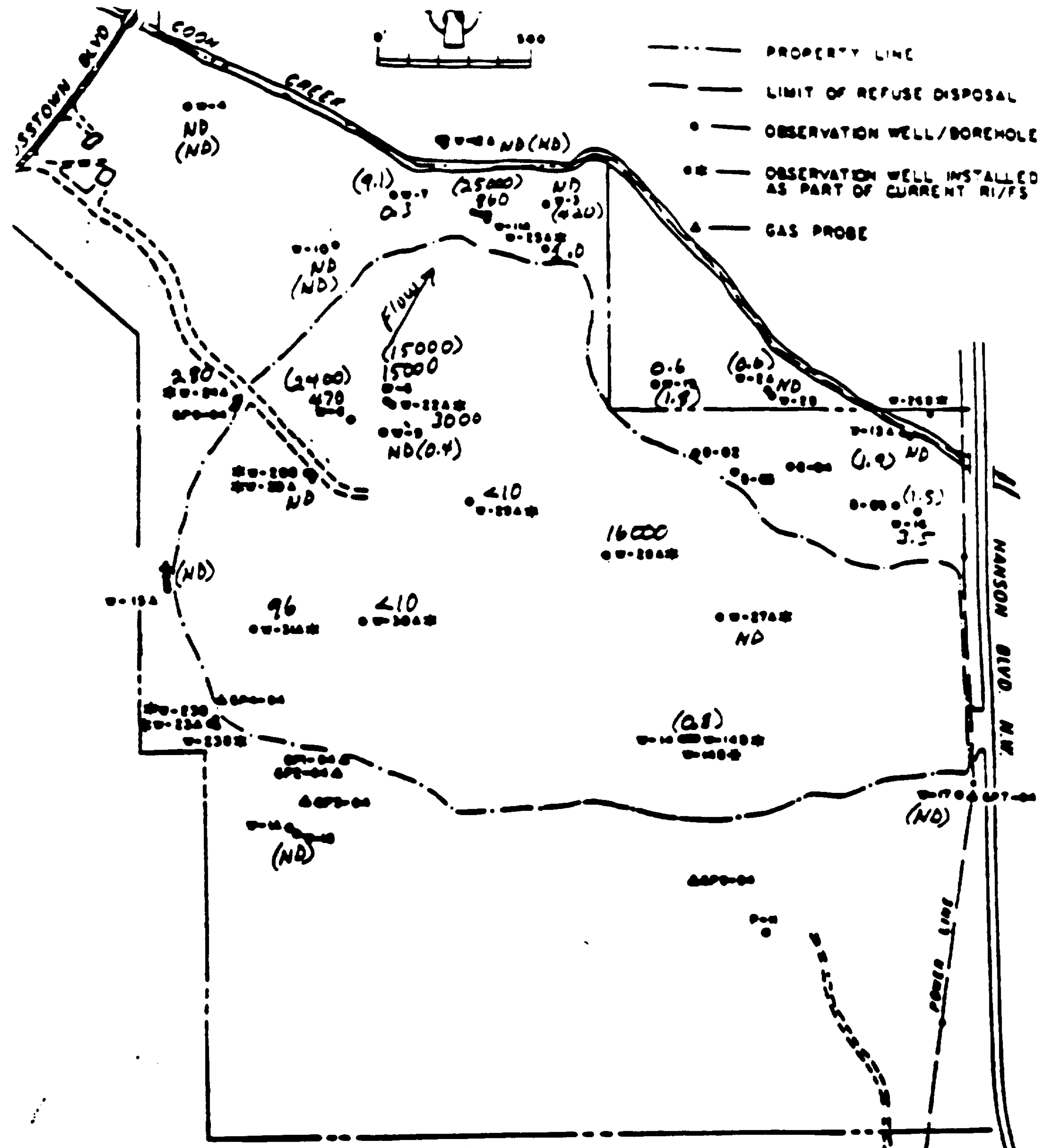

Figure 6: Water Table Well Cis-1,2-Dichloroethylene Concentrations (ppb) for 3/85 – 5/85 Sampling and June 1983 Sampling (Parenthesized)

ND = compound not detected at low- or sub-ppb level.

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ATTACHMENT 11
WASTE DISPOSAL ENGINEERING

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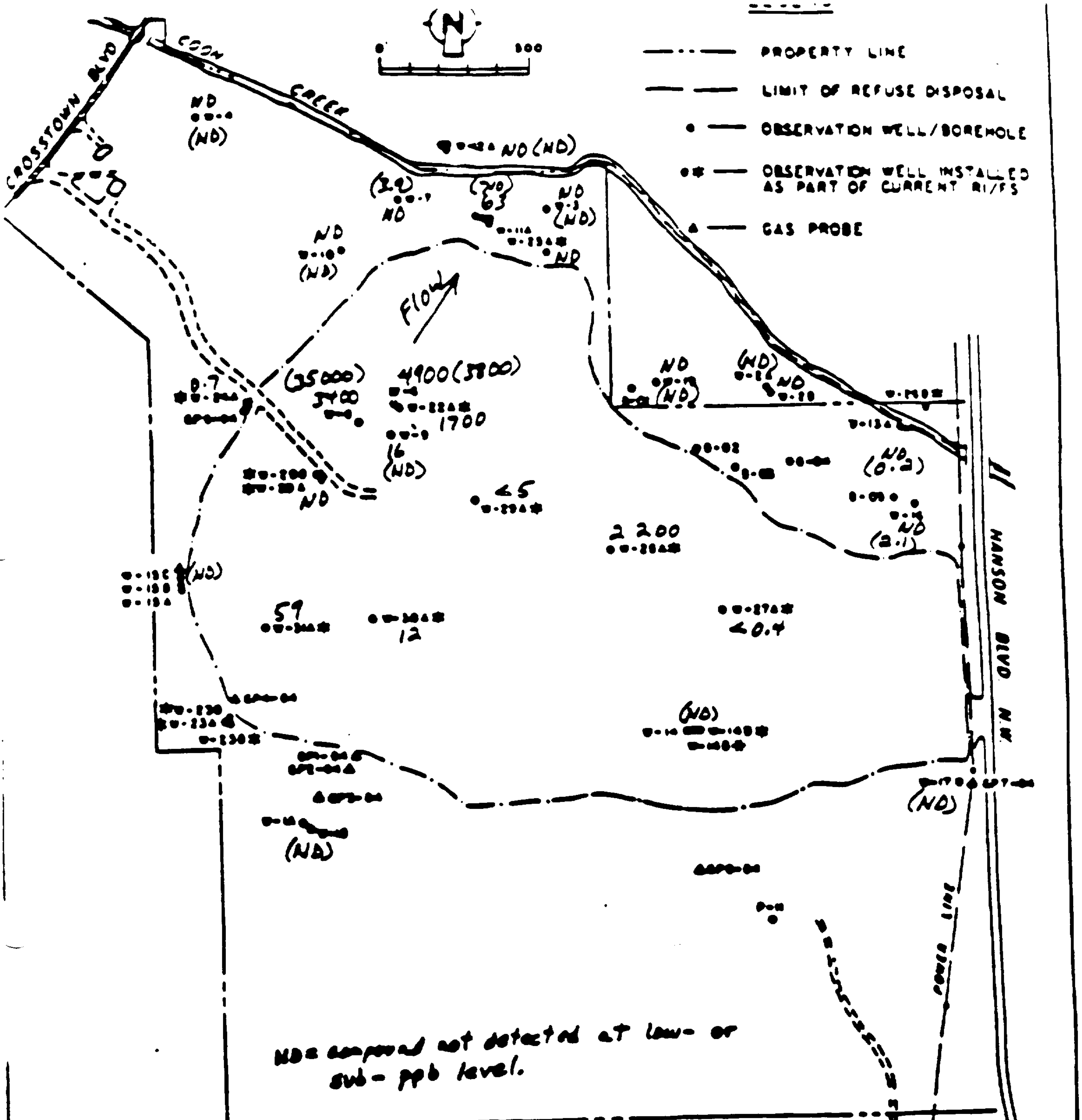

Figure 8:
Water Table Well 1,1,1-Trichloroethane
Concentrations (ppb) for 3/85 to 5/85 Sampling
and for June 1983 Sampling
(Parenthesized values in ppb)

ATTACHMENT 12
WASTE DISPOSAL ENGINEERING

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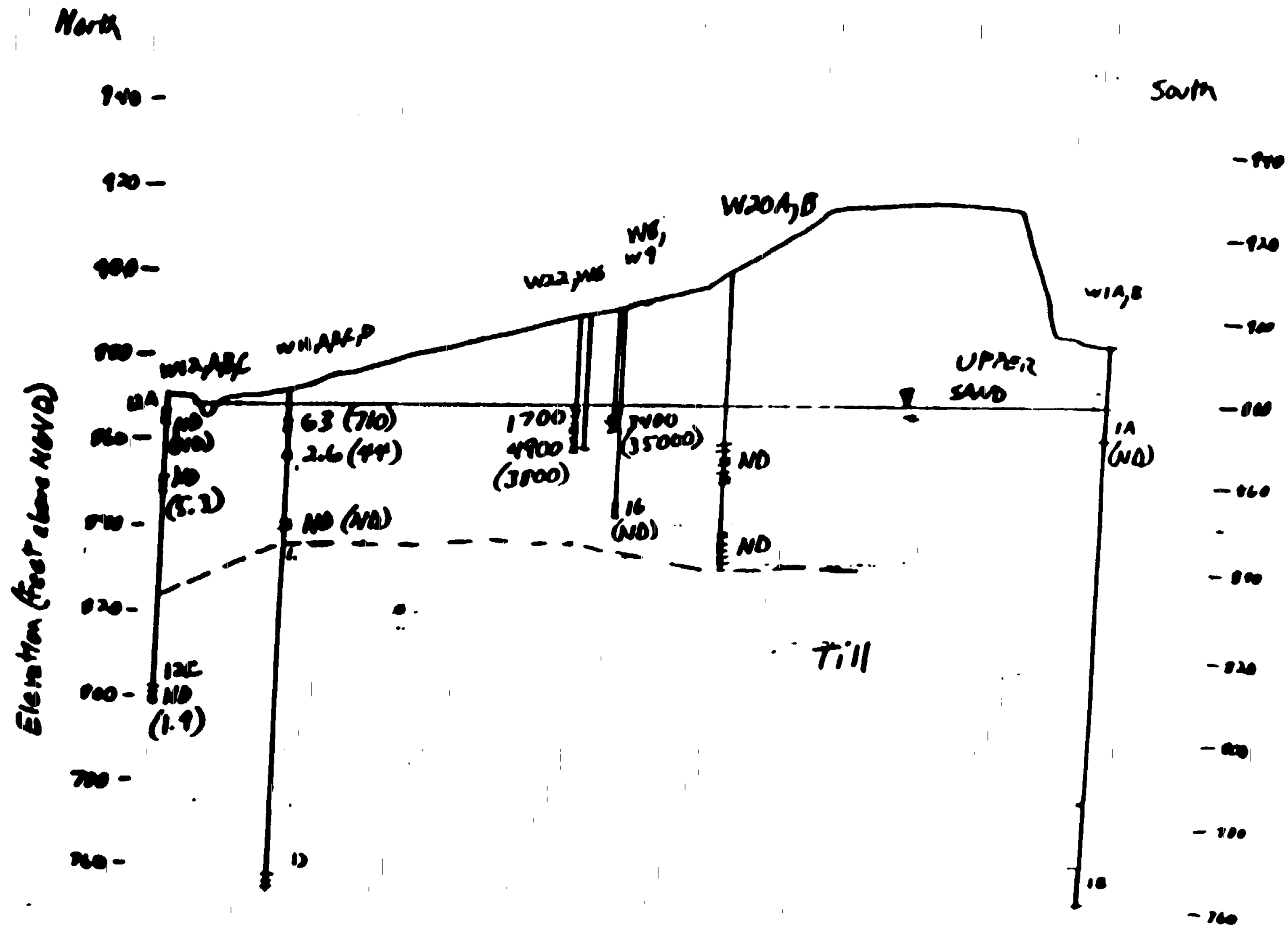
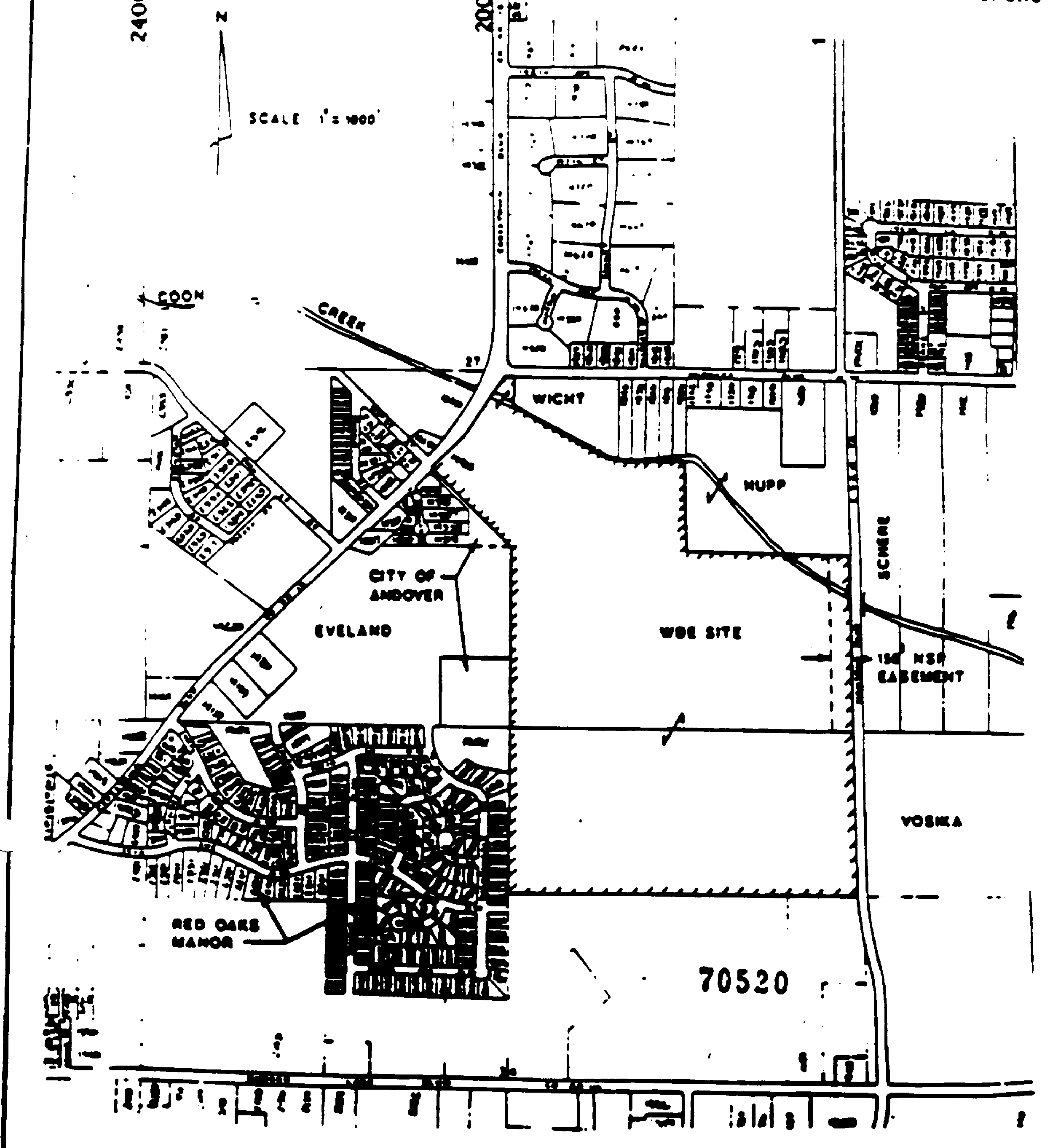


Figure 12:
1,1,1-Trichloroethane Concentrations for Samples Obtained 3/85 - 5/85 (ppb) and for Samples Obtained June 1983 (parenthesized values in ppb)

ND = compound not detected at low- or sub-ppb range.

ATTACHMENT 13
WASTE DISPOSAL ENGINEERING

ATTACHMENT 14
WASTE DISPOSAL ENGINEERING



SOURCE: ANOKA COUNTY

WDE RI/FS EVALUATION	E.A. HICKOK & ASSOCIATES HYDROLOGISTS · ENGINEERS MINNEAPOLIS · MINNESOTA	APRIL, 1984
PROPERTY OWNERSHIP MAP		5

TABLE 3.4

DEVELOPMENT OF POTENTIAL EXPOSURE PATHWAYS - WDE SANITARY LANDFILL
(See Worksheet 4.2 of the Superfund Public Health Evaluation Manual)

Release/Source Mechanism	Release/ Transport Medium	Potential Exposure Route	Potential Exposure Point	Number of People Potentially Affected	Pathway Complete
Dust/volatilization	Air	- inhalation - dermal	- on-site	<50	yes
Soil gas	Air	- inhalation - dermal	- within 500 feet of limit of refuse	<50	yes
Reaction between incompatible wastes	Air	- inhalation	- residential within 1 mile of the site	1,000	no
Pit leakage	Upper Sand Aquifer	- ingestion of drinking water	- on-site	0	no
Landfill leakage	Upper Sand Aquifer	- ingestion of drinking water	- on-site	0	no
Possible future leakage from upper sand aquifer	Lower Sand Aquifer	- ingestion of drinking water	- residential within 0.5 miles west and southwest of site	1,000	no
Discharge from upper sand aquifer	Surface Water	- ingestion of water and fish - dermal contact - indirect exposure through ingestion of exposed crops or animals	- Coon Creek - Mississippi River	<100 <10,000	yes yes

continued....

TABLE 3.5

COMPARISON OF SOIL PROBE GAS ANALYSIS AND TLV[1] VALUES**

Indicator Chemicals and Other Chemicals Reported in Gas Probe Samples[2]	TLV(ppm)	Highest Conestration in Soil Gas (ppm)
1,1 Dichloroethane*	200	ND[4]
1,2 Dichloroethene*	200	ND
1,1,2-Trichlorotrifluoroethane*	1,000[3]	1.30
1,1,1-trichloroethane*	350	ND
Methyl ethyl ketone	200	0.16
Methyl Isobutylketone*	50	0.37
Dichloroethane	10	0.12
Toluene*	100	9.52
Xylene*	100	2.18
Methylene chloride	350	0.07
Acetone	1,780	0.02
Tetrahydrofuran	200	0.17
1,1 Dichloropropene	1	0.74
Benzene	10	2.47
Dibromochloromethane	200	0.93
1,1,2 trichloroethane	10	0.92
1,1,2,2-Tetrachloroethane	1	54.5
Trichloroethene	50	0.31
1,3 Dichloropropene	1	1.74
Ethylbenzene	100	0.27
Cumene	50	1.41
Ethyl ether	400	0.16

* Indicator Chemicals
** This follows methodologies of Section 4.3 of the Manual

(1) TLV - Threshold Limit Values from "Threshold Limit Values and Biological Exposure Indices for 1985-86" American Conferance of Governmental Industrial Hygienists

(2) Highest concentrations in sample analyzed.

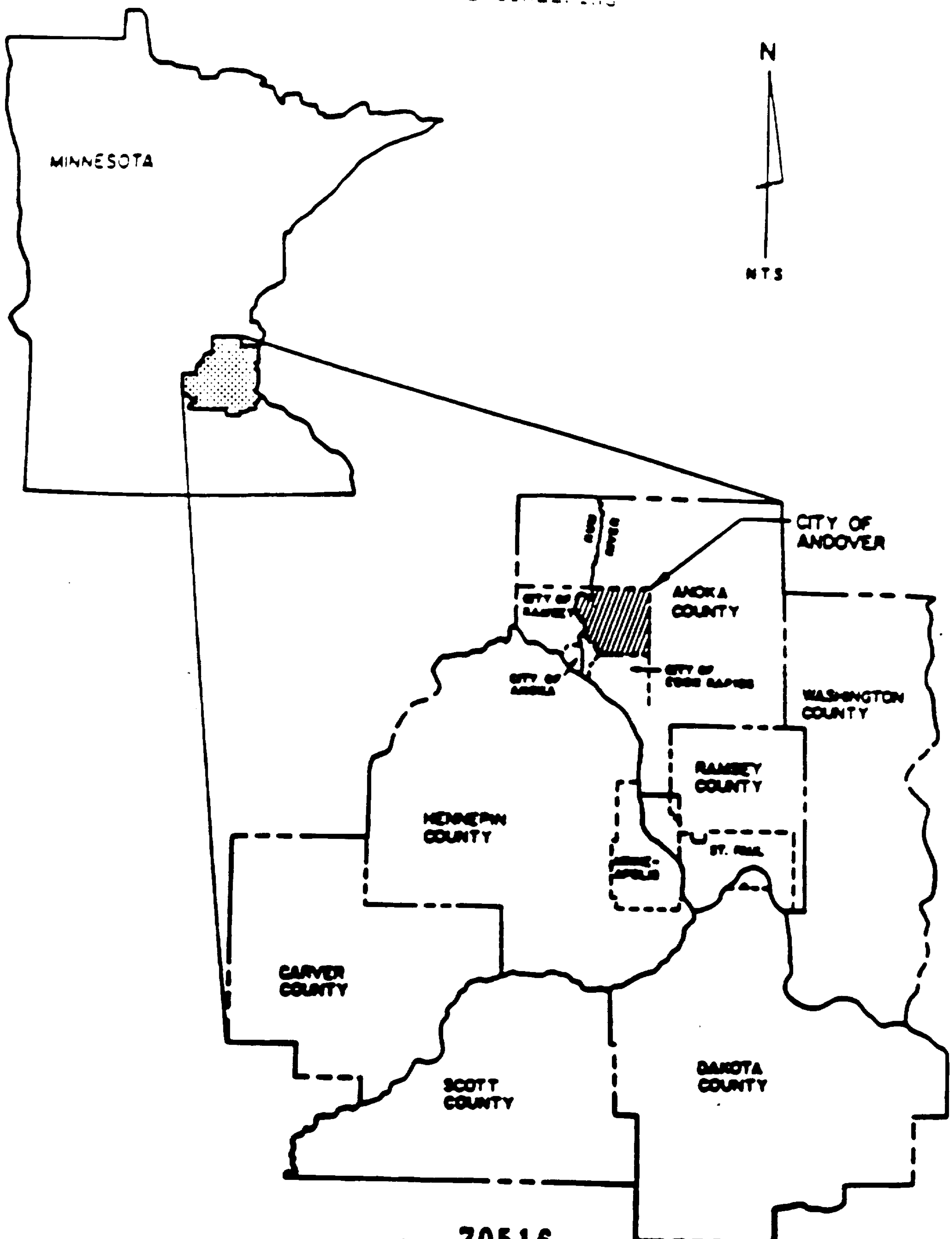
(3) TLV available for 1,1,2-trichlorofluoroethane.

(4) ND = Not detected in soil probe gases

TABLE 3.4

DEVELOPMENT OF POTENTIAL EXPOSURE PATHWAYS - WDE SANITARY LANDFILL
(See Worksheet 4.2 of the Superfund Public Health Evaluation Manual)

Release/Source Mechanism	Release/Transport Medium	Potential Exposure Route	Potential Exposure Point	Number of People Potentially Affected	Pathway Complete
Tracking of lime sludge *	Soil	- inhalation and/or ingestion of lime sludge	- local residents who participate in recreational activities on-site	<50	yes
NAPL	Upper Sand Aquifer a) on top of water surface (floaters) b) on top of till surface (sinkers)	- migration on top of water surface - gravity flow on top of till surface	- Coon Creek - Coon Creek Lower Sand Aquifer	0	no
Exposed waste/ leachate and lime sludge	none	- direct dermal contact - inhalation - ingestion	- individuals on site for recreation	<50	yes



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WDE RI/FS EVALUATION	E.A. HICKOK & ASSOCIATES HYDROLOGISTS · ENGINEERS MINNEAPOLIS · MINNESOTA	APRIL, 1984
LOCATION MAP–GENERAL AREA		1

May 1, 1986	The MPCA issued a news release announcing a public meeting to provide a project update.
May 1986	The MPCA prepared an updated fact sheet which included investigation results and a list of alternatives being considered. The fact sheet (and a public meeting announcement) was delivered door-to-door by members of the community.
May 14, 1986	The MPCA sponsored a public meeting at the Andover City Hall as a project update.
June 16, 1986	The MPCA provided an update to the staff and members of the Coon Creek Watershed District.
October 15, 1986	Meeting held with officials of the City of Andover, Anoka County, MPCA, and representatives of the SW-28 Group to discuss the Detailed Analysis Report.
Sept. 3, 1987	The MPCA issued a news release announcing the recommended alternatives and a public meeting.
Sept. 8, 1987	The U.S. EPA sponsored an ad in the Minneapolis daily paper which included the meeting date and the recommended alternatives.
Sept. 14, 1987	The U.S. EPA and MPCA sponsored a public meeting at the Andover City Hall to discuss the recommended alternatives.

Throughout the project, reports and fact sheets were made available at the Andover City Hall. During the latter half of 1985, when investigation results were coming in, a number of meetings were held with city and county officials to respond to their questions on the findings.

Throughout the course of the RI/FS, the MPCA, Anoka County, and City of Andover officials have discussed on an individual basis with many private citizens. Approximately 75 private citizens were on a regular mailing list to receive all fact sheets and news releases and all aspects of the RI/FS and related activities.

In addition, a number of news publications have reported major findings, developments, or decisions throughout the RI/FS process. City of Andover and Anoka County officials have been invited to and actively participate in discussions and meetings with the SW-28 Group throughout the RI/FS process. They have also commented extensively on the submittals related to the RI/FS process.

These actions will be implemented in accordance with applicable laws and regulations.

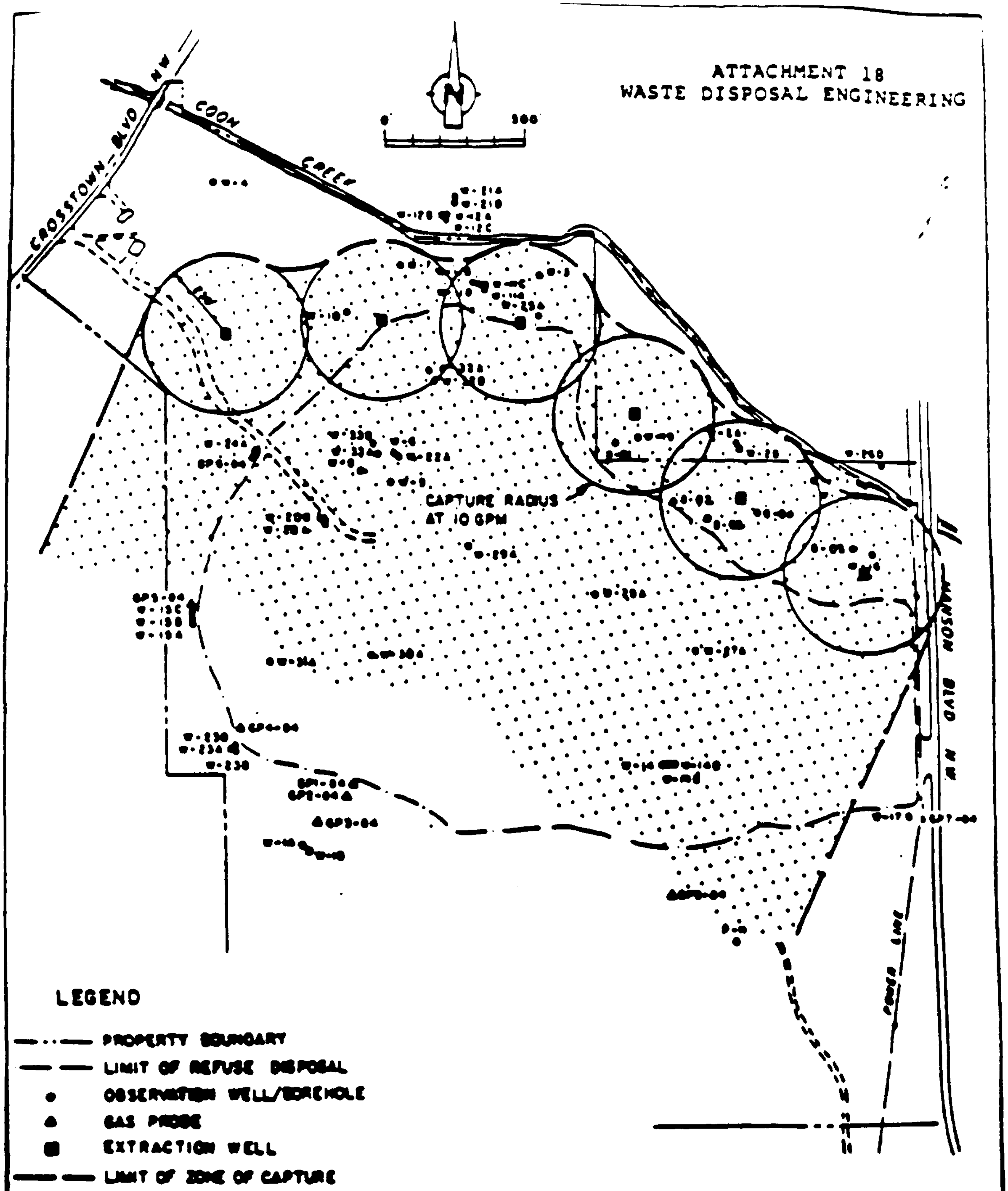


figure 2.26

GROUNDWATER EXTRACTION
WELL LOCATION - LANDFILL
WDE, Andover, Minnesota

CRA

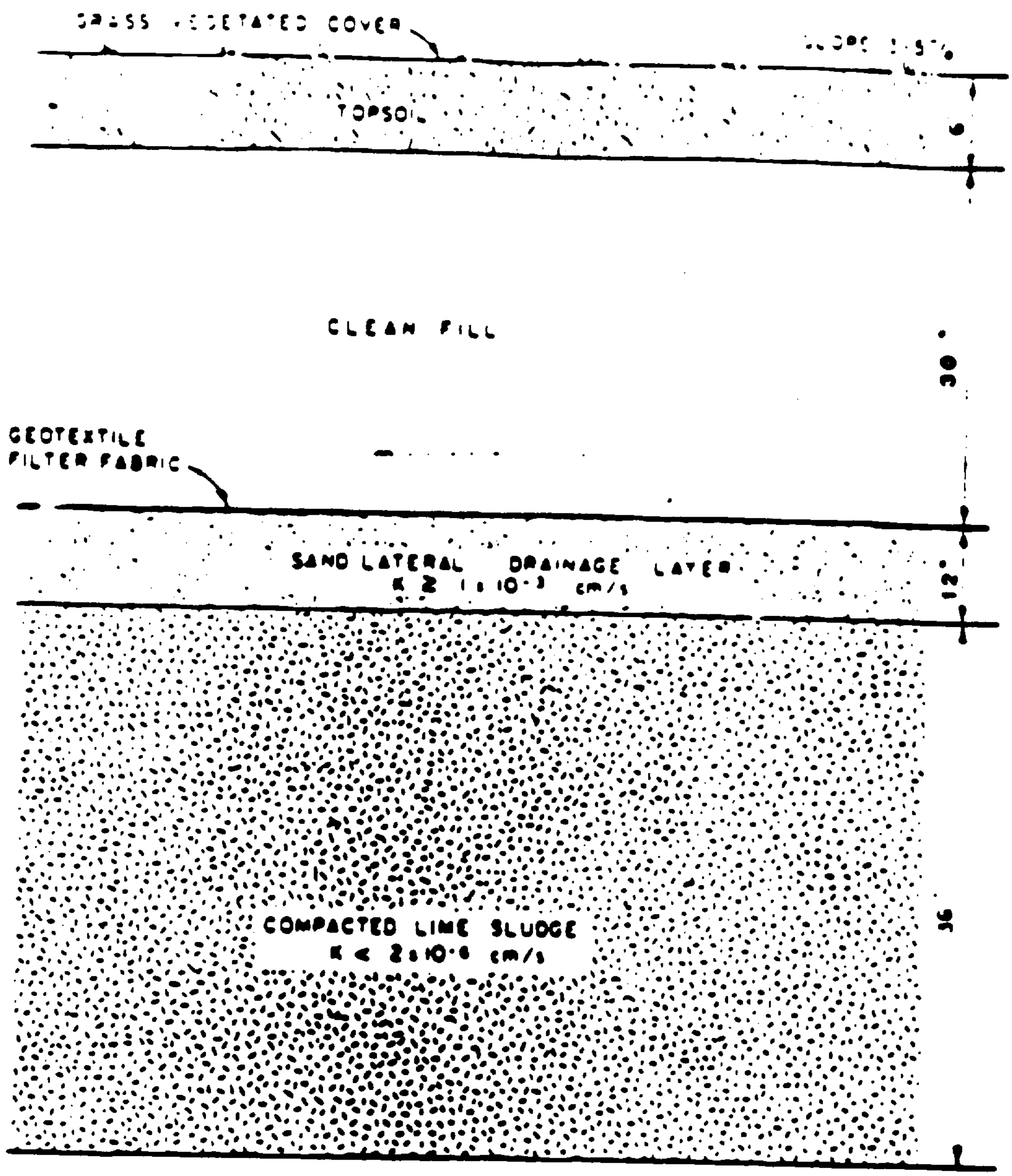


figure 2.7
SCHEMATIC CROSS SECTION OF COMPACTED LIME SLUDGE CAP MEETING RCRA PERFORMANCE STANDARDS
WDE, Andover, Minnesota

ATTACHMENT 20
WASTE DISPOSAL ENGINEER

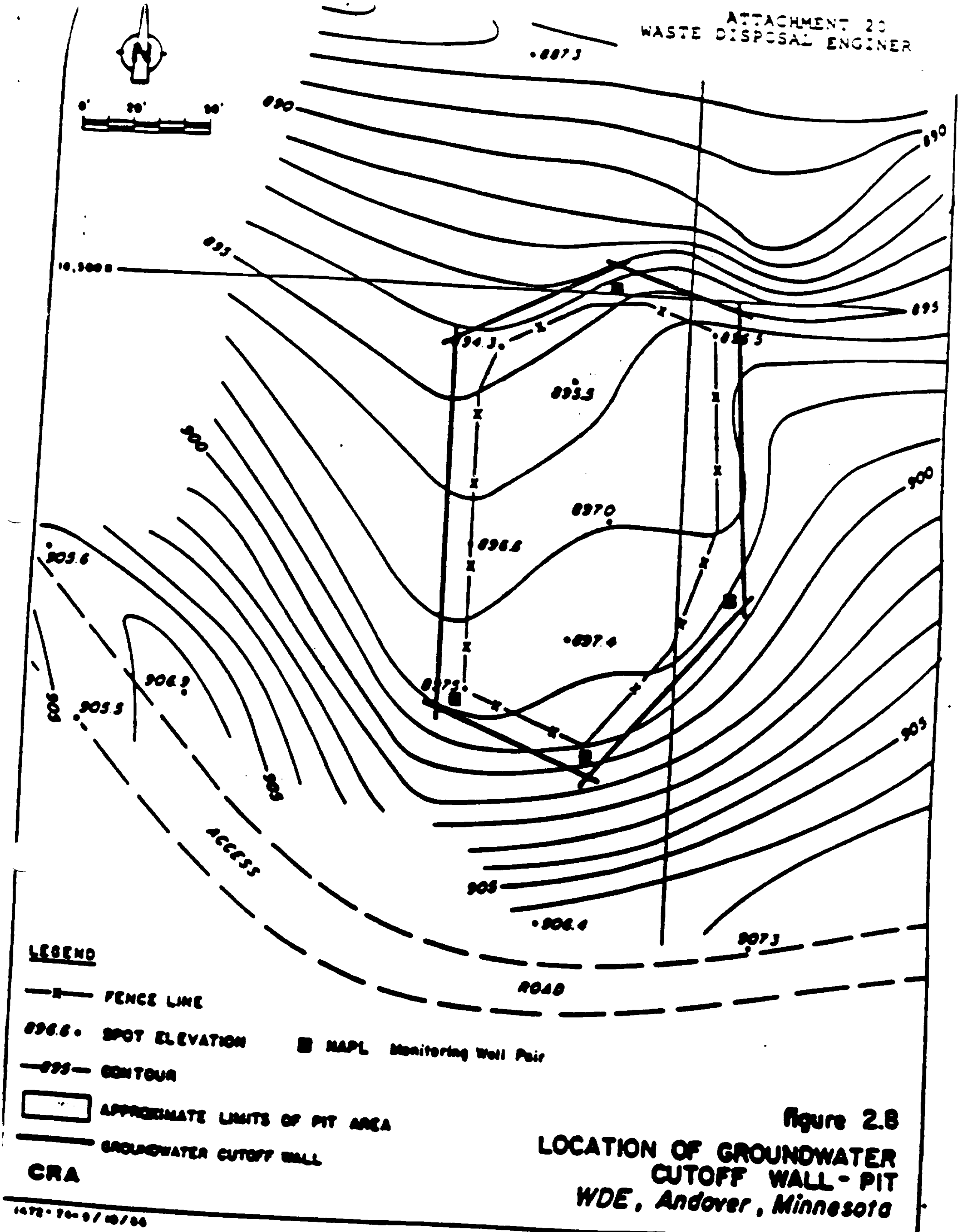


figure 2.8
LOCATION OF GROUNDWATER CUTOFF WALL - PIT
WDE, Andover, Minnesota

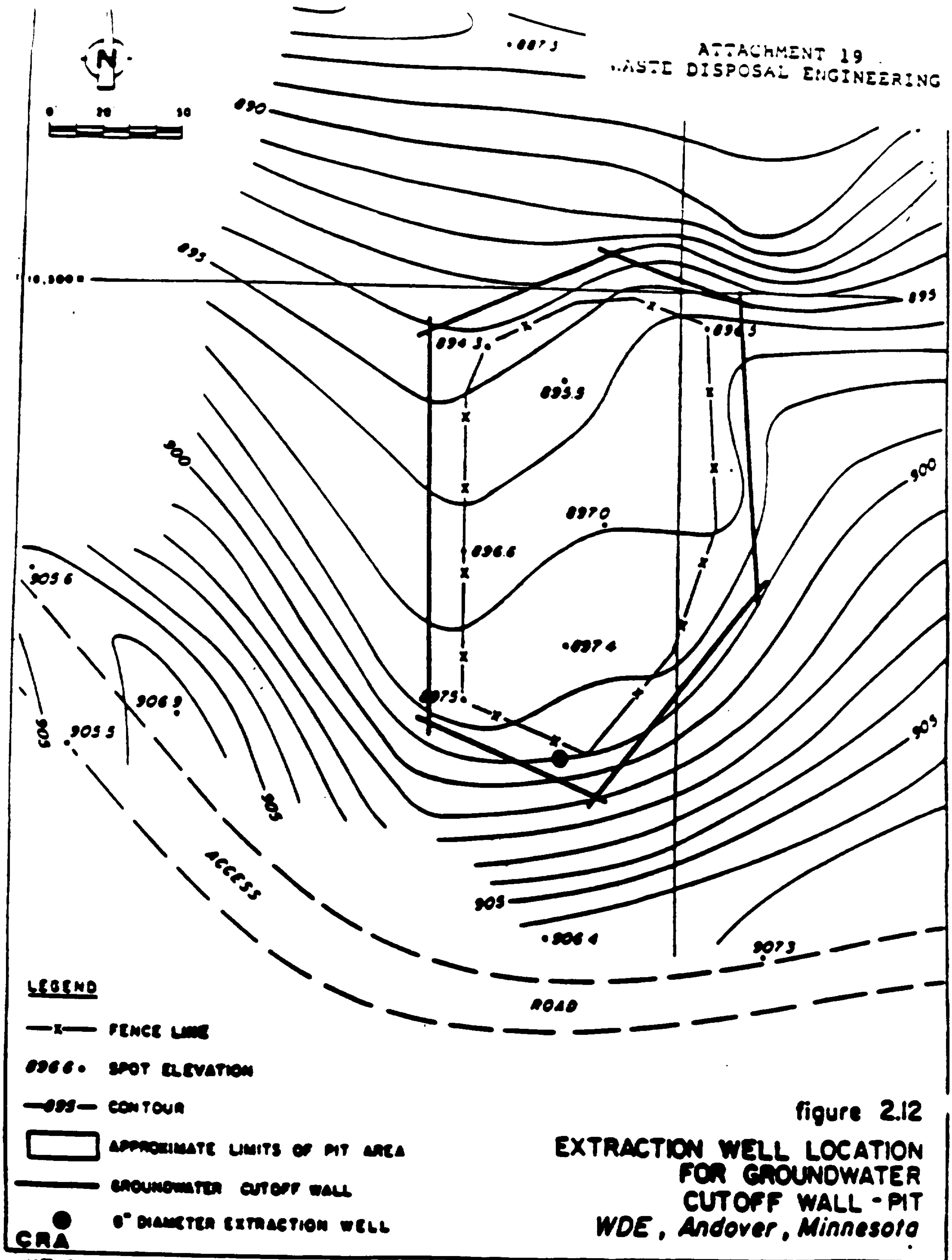


figure 2.12

EXTRACTION WELL LOCATION FOR GROUNDWATER CUTOFF WALL - PIT

WDE, Andover, Minnesota

Responsiveness Summary for the Waste Disposal
Engineering Site in Andover, Minnesota.

1. Introduction

The United States Environmental Protection Agency (U.S. EPA) obtained information on the types and extent of contamination, evaluated remedial measures, and recommended remedial actions for ground and surface water contamination, gas emissions, and direct contact concerns resulting from the Waste Disposal Engineering Site in Andover, Minnesota. As part of this process, U.S. EPA submitted its recommended alternative for public comment for a twenty-one day period. Public participation in Superfund projects is required under the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and the National Oil and Hazardous Substances Contingency Plan (NCP). A public meeting to discuss alternatives, explain the proposed remedy and solicit public comment was held at the Andover City Hall on September 14, 1987. Comments received by the public are considered in the selection of the remedial action for the Site. This document summarizes the comments received and states U.S. EPA's responses to those comments.

The responsiveness summary has four section:

a. Introduction. This section briefly explains this document.

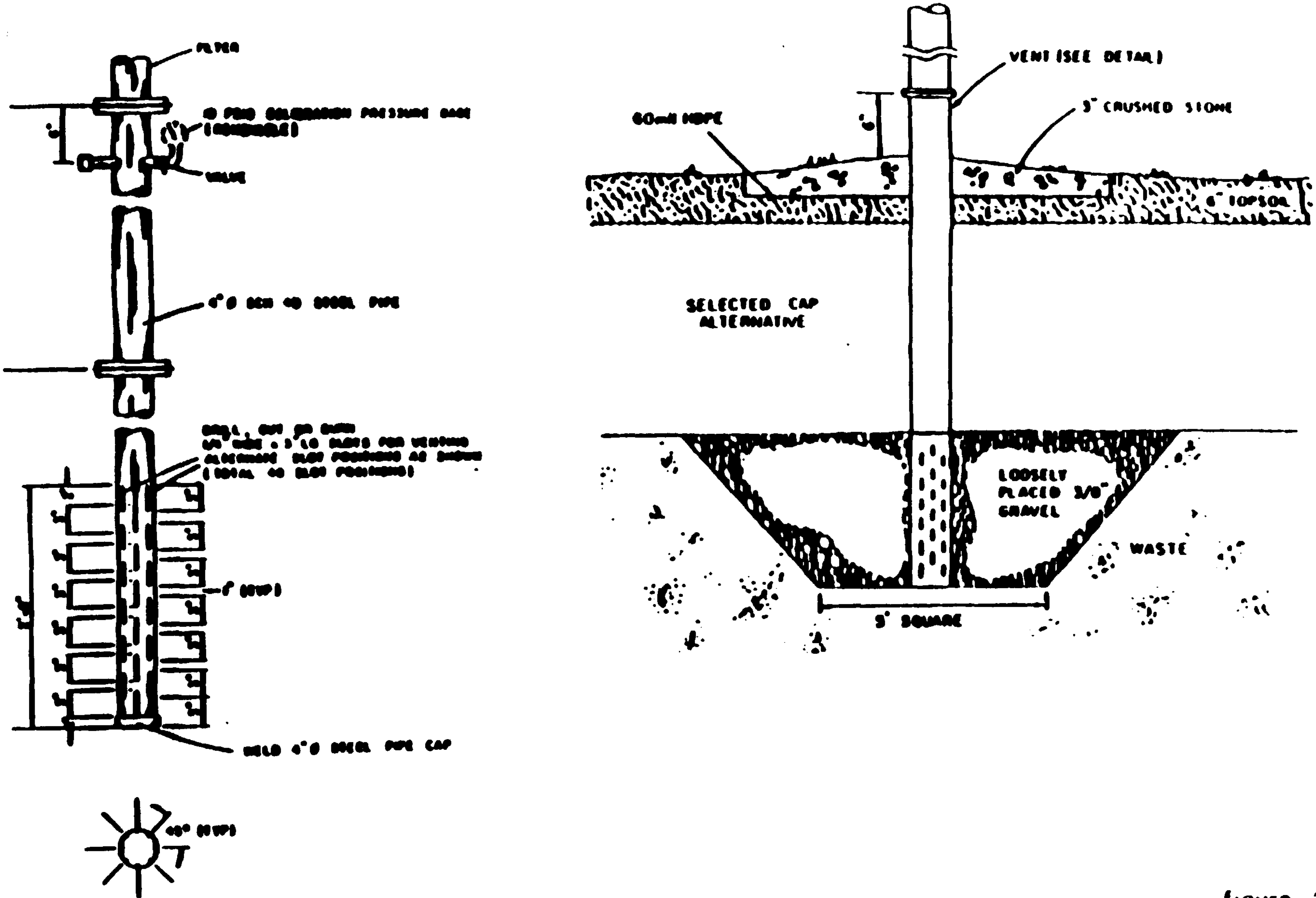
b. Overview. This document briefly presents a history of community relations at the Site.

c. Background on Community Involvement. This section briefly presents a history of community relations.

d. Summary of Public Comments Received During the Public Comment Period and U.S. EPA's Responses.

2. Overview

During the public comment period, the U.S. EPA and the Minnesota Pollution Control Agency (MPCA) held a public meeting to discuss the Site. The U.S. EPA and MPCA recommended a solution, similar to the potentially responsible parties recommendation, through some additions to the feasibility study document entitled the "Detailed Analysis Report". The recommended solution includes long-term (indefinite) ground water extraction through pump-out wells in the Upper Sand aquifer between the landfill and Coon Creek to keep contaminants from migrating off-site; a Resource Conservation and Recovery Act (RCRA)-compliant lime sludge cap to cover the landfill, safely vent and treat landfill gases, and reduce infiltration through the waste; a slurry wall around the Pit to contain the concentration of wastes within the Pit; a ground water extraction well within the slurry wall to maintain an inward hydraulic gradient such that if the wall leaks the water will flow into the walled area and be extracted by the pump-out well thereby containing contaminants; filling



VENT DETAIL

ATTACHMENT 21
WASTE DISPOSAL ENGINEERING

figure 2 1

TYPICAL GAS VENT CONSTRUCTION
WDE, Andover, Minnesota

CRA

in a wetland area in the northeast corner of the Site and replacing it nearby; treatment of extracted ground water by carbon adsorption; discharge of extracted ground water to Coon Creek; and long-term monitoring of the remedial activities (the cap, the extraction system, etc.), the contamination (ground water, gas, etc.), and the receptors (Coon Creek, residents' wells, the Lower Sand aquifer, etc.). In addition, the recommendation included consideration of institutional controls to keep people from placing new wells in the Upper Sand aquifer just north of Coon Creek where contamination has been found and in the Lower Sand aquifer around the Site in order to maintain the existing upward water pressure between the Upper and Lower Sand aquifers. The addition of municipal water to the area by the City of Andover is expected to reduce the likelihood of new wells. The Upper Sand aquifer just north of the creek is near a sanitary sewer line, is in the floodplain, will be isolated from the contamination by the extraction well system, and will, in the long-term, cleanse itself. These conditions act to reduce the probablity of new wells being placed in the area. The Lower Sand aquifer around the Site is expected to continue to be stressed by the construction of new private drinking water wells which would increase the likelihood of a downward water pressure between the Upper and Lower Sand aquifers. However, the municipal water will reduce the stress on the aquifers that would have been expected due to the construction of new wells and the monitoring will give warning if action is needed to maintain an upward gradient. Consequently, although they are considered prudent, the need for institutional controls beyond the Site area (includes all land just south of Coon Creek) is not critical at this time.

Comments were received at the public meeting on the Waste Disposal Engineering Site held in the Andover City Hall in September of 1987, and by the potentially responsible parties (PRPs) during the public comment period.

3. Background on Community Involvement

Since 1983 the MPCA and the U.S. EPA have been involved in numerous community relations activities associated with the Waste Disposal Engineering Site. Numerous fact sheets and news releases were issued throughout the remedial investigation/feasibility study (RI/FS) to, among others, approximately 75 private citizens on the regular mailing list. Public meetings were held at the beginning of the project, on the remedial investigation report, after the alternatives report, and on the proposed remedy, and City of Andover and Anoka County officials were invited to and participated in discussions with, and commented extensively on submittals of the SW-28 Group (PRPs who came forward to conduct the RI/FS) throughout the RI/FS process.

On September 3, 1987, the MPCA issued a news release on the proposed remedy and the public meeting. On September 8, 1987, U.S. EPA sponsored an ad in the Minneapolis daily paper announcing the beginning of the public comment period, the availability of the RI/FS, as modified, for public inspection, the meeting date, and the proposed remedy. On September 14, 1987, a public meeting was held in the Andover City Hall and public comments were received. On September 29, 1987, the public comment period was closed.

During the comment period, comment was received from the SW-28 Group. No other public comments were received.

4. <u>Summary of Public Comments Received During the Public Comment Period</u>

The following are comments from the September 14, 1987 public meeting in the Andover City Hall.

a. <u>Comment:</u> Why does it take so long for anything to happen? The Site has been known since 1968 and twenty years later we are still talking about it.

<u>Response:</u> Although the Site was purchased by Waste Disposal Engineering, Inc., in 1968, it was a permitted and operating landfill in the 1970's and early 1980's. The framework for the U.S. EPA to address this Site began with the passage of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) on December 11, 1980. Once the authority was established by CERCLA, a process had to be established to find potential sites and decide which ones should be addressed first with limited Federal resources. Using this process the Waste Disposal Engineering Site was announced as a potential Superfund site on July 23, 1982. Initially, background information on the Site and potentially responsible parties (PRPs), those persons that may be liable for problems at the Site, was compiled. Using the background information, statements of work that generally describe the kind of studies that are necessary to characterize the Site were prepared, and the PRPs were notified that they were PRPs, that the U.S. EPA intended to do work at the Site, and that they might be liable for the U.S. EPA costs of that work. In March of 1984, a written agreement, called a Consent Order, was signed in which the PRPs committed to conduct a remedial investigation/ feasibility study (RI/FS) based on statements of work contained in the Consent Order. The RI/FS is to characterize the Site and analyze various solutions such that the cost-effective solution that protects the public health, welfare and the environment can be chosen. The information obtained during and presented in the RI/FS must be obtained in a manner that will stand up in a court of law. Once the U.S. EPA, in consultation with the MPCA, designates its chosen solution in a Record of Decision (ROD), the PRPs will design the solution as part of the Consent Order. Negotiations will then occur to determine if the PRPs will conduct the construction. If not, the U.S. EPA can either conduct the action itself and sue for its costs later, or it can seek to have the court require that the PRPs do the cleanup. If so, the MPCA, U.S.EPA, and PRPs can sign a Consent Decree, an agreement lodged with a court, to have the PRPs do the cleanup. In summary, much of the time the Site was in operation it was not known as a problem to be addressed by Superfund (i.e., 1960's and 1970's). When the Site was recognized, it was put into the Superfund remedial action process. The process is deliberate, but it does move forward along established lines toward Site cleanup. Two problems which have taken more time than originally expected were establishing analytical procedures and finding a laboratory capable of conducting the work as specified, and determining and incorporating the additional requirements of the Superfund Amendments and Reauthorization Act of 1986 (SARA).

b. Comment: The levels of toxicity in the discharge water have not been specified.

Response: The National Pollutant Discharge Elimination System (NPDES) permit requirements under the Federal Clean Water Act are an applicable or relevant and appropriate requirement (ARAR) which will be addressed at this Site. The permit requirements define the actual levels of contaminants that can be discharged to the Creek, as well as the conditions under which discharges can occur. Factors considered in making these requirements include the flow in the creek, the dilution given to the discharge by the creek, and Water Quality Criteria. In other words, the creek conditions at the Site are considered in conjunction with the concentrations of the contaminants to determine the appropriate discharge levels that will not adversely impact the creek and its uses. Specific effluent limitations will be defined for the discharge during the remedial design and as part of the NPDES process.

It should also be understood that the ground water in the Upper Sand aquifer ultimately discharges to the creek. Therefore, by removing and treating the ground water before it enters the creek, the total contaminant mass that enters the creek is reduced.

c. Comment: The standards change as more information becomes available and there is no real assurance from the scientific community that the levels are safe.

Response: It is a fact that standards can change as new information becomes available. However, the standards are generally conservatively applied such that factors of safety are built in to the process. Further, under the Superfund Amendments and Reauthorization Act of 1986 (SARA), Section 121(c), the U.S. EPA is required to reevalute a Site where contaminants are left on-site no less often than every five years after initiation of the remedial action to assure that human health and the environment are being protected by the remedial action being implemented. The reevaluation will consider any new potential health impacts which may have been identified due to scientific advances.

d. Comment: Looking at a thirty-year plan for monitoring wells, there are concerns about well breakdowns, improper reading of the wells, contamination of samples, and poor laboratory results.

Response: The monitoring wells are expected to be in operation indefinitely. The thirty-year period is used for cost comparisons because after that period of time the present worth value of the costs tend to be negligible. As part of the operations and maintenance of the proposed remedial action, provisions are made to assure that proper care is taken in the implementation of the monitioring program. If the wells break down, they will be repaired or replaced. There will be a specific plan for the methods to be used in sampling and analysis of samples. There will also be checks built into the procedures to assure adequate sampling and analysis is performed (blanks, split samples, calibration checks, etc.). The Site will also undergo periodic review by the U.S. EPA under SARA.

e. Comment: A special assessment on a house was to support a holding pond to keep water out of Coon Creek. Putting more water into Coon Creek should be avoided.

Response: Since the Upper Sand aquifer discharges into Coon Creek anyway, the discharge of extracted ground water is not the same as discharging an independent source of water into the creek. Furthermore, the analysis of alternatives indicated that the creek discharge would be favorable compared to the discharge which would involve removing the water from the creek area, discharge to the sanitary sewer and ultimately to the sewage treatment plant. As discussed in the public meeting, discharge to the sanitary sewer would reduce available sewer capacity, which would limit growth, which would reduce the available tax base for the community. The proposed discharge is expected to be limited such that adverse impacts to the creek resulting from such discharges will be mitigated (It is one of the considerations of the NPDES process).

f. Comment: The local community is paying for municipal water to protect them and that investment is not being addressed by the people who created the problem.

Response: The private drinking water wells in the area are not now being adversely affected by the Site. With the implementation of the proposed remedy, those wells are not expected to be impacted by the Site.

g. Comment: The economic losses to the community are staggering already and not a drop of water has been purified.

Response: The proposed remedy is designed to contain contamination from the Site and to treat contaminant discharges before they are discharged into the environment. Upon implementation of the proposed remedy, water is expected to be treated.

h. Comment: Can kids go in Coon Creek wading and swimming, and not be harmed?

Response: The Minnesota Department of Health and the public health evaluation of current conditions in the Detailed Analysis Report indicate that the existing health risks in Coon Creek are not such that those activities need to be prohibited. The proposed remedy is primarily to assure that the potential for a significant problem resulting from the volumes of wastes that went into the landfill is never realized in the creek.

i. Comment: How far down from the Site was Coon Creek sampled?

Response: As part of the remedial investigation, Coon Creek sediments were sampled up to three and a half miles downstream of the Site.

j. Comment: When discharging to Coon Creek will the quality of Coon Creek water be better than with leachate discharging into it?

Response: Overall, since it is expected that the Upper Sand aquifer discharges entirely into Coon Creek from the Site, the contaminant loadings to Coon Creek will be reduced, the water quality improved, and the potential for significant contaminant discharges into the creek from the Site through the ground water eliminated by the proposed remedy.

k. Comment: Is Coon Creek going to be dealt with in terms of the volume of the discharge into it?

Response: Yes. Based on discussions with the MPCA, it is not expected that the proposed discharge of around 60 gallons per minute will adversely impact the creek. This will be considered further in terms of NPDES requirements.

The following are comments from the SW-28 Group (the PRPs who volunteered to come forward and conduct the RI/FS and remedial design under a Consent Order with the U.S. EPA and MPCA) as expressed in their September 10, 1987 letter.

l. Comment: For U.S. EPA to issue its Record of Decision (ROD) before the end of its fiscal year, September 30, 1987, would be inappropriate.

Response: Since the public comment period did not end until September 29, 1987, U.S. EPA agreed with the comment and did not publish the ROD before the end of the fiscal year.

m. Comment: The SW-28 Group reserves the right to supplement the record beyond the 21-day public comment period.

Response: Under 40 CFR Part 300.67(d) of the NCP, the feasibility study must be provided to the public for review and comment for a period of not less than 21 calendar days. This was done for the Waste Disposal Engineering Site in that the public comment period was 21 days. Further, since the SW-28 Group prepared the feasibility study and has discussed issues at the Site with the U.S. EPA and the MPCA extensively throughout the previous months, it was not considered appropriate to extend the public comment period for undefined reasons for an indefinite length of time. The public comment period closed on September 29, 1987.

The following is a comment from the SW-28 Group as expressed in their September 24, 1987 comment letter.

n. Comment: The additional six inches of drainage layer and six inches of fill required by U.S. EPA and MPCA modifications to the Detailed Analysis Report are not required to meet the technical performance standards of a Resource Conservation and Recovery Act (RCRA) landfill closure cap.

Response: RCRA landfill closure (see 40 CFR Part 264), which is an ARAR, requires five elements be addressed. They are: 1) provide long-term minimization of migration of liquids through the closed landfill; 2) function with minimum maintenance; 3) promote drainage and minimize erosion or abrasion of the cover; 4) accommodate settling and subsidence so that the cover's integrity is maintained; and 5) have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present. Items 1), 2), and 3) were of concern due to the original design of the lime sludge cap. By allowing the open field frost penetration in the area of four feet to penetrate a foot into the lime sludge, the impermeable layer, the ability of the cap structurally to continue to support the rest of the cap (function with a minimum of maintenance) and to maintain long-term minimization of liquids through the landfill is put in doubt because heaving could both weaken and allow more infiltration through the lime sludge. This is especially significant because the lime sludge is not being placed in six-inch lifts as is normally expected to assure the integrity of the impermeable layer and because the history of lime sludge as an adequate impermeable layer is lacking. The surface layers of the lime sludge are structurally significant and must be protected from frost penetration. The need to promote adequate drainage requires that a one foot drainage layer be constructed. The proposed six-inch layer is not considered adequate, considering construction techniques, to drain and not be clogged. With these modifications and the testing to be required during design of the cap, it is expected that the lime sludge cap will be constructed to be generally consistent with RCRA performance standards.

WDE SITE INDEX

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I. PASI			
1. Preliminary Assessment and Site Investigation (There are two site inspection reports)	USEPA	7/1981	23
2. National Priorities Checklist (NPL)	USEPA	none	1
3. Quality Control Notes	Michael Gifford	8/10/82	25
4. Enforcement Summary and Status Report	USEPA	none	5
5. Conditions and Status Report	Kerry Street	1983	1
6. Worksheets to grade the site	Doug Day John E. Aho	9/10/81	5
II. PASI APPENDIX			
1. Bibliography for Document which ranks the site. (Includes references)	USEPA	6/28/82	16
III. WORKPLAN			
1. Landfill RI/FS	USEPA	4/1984	32
2. Landfill and Pit Safety Plan	USEPA	4/1984	70
3. Evaluation Report Landfill and Pit RI/FS	USEPA	4/1984	80
4. Security Plan Landfill RI/FS	USEPA	4/1984	6
5. Security Plan Pit RI/FS	USEPA	4/1984	6
6. RI: Pit RI/FS	USEPA	4/1984	3[illegible]
IV. WORKPLAN CORRESPONDENCE			
1. Letter to E.A. Hickok from Minnesoat Pollution Control Agency (MPCA) requesting modifications to the Evaluation Report, Landfill and Pit RI/FS.	MPCA	6/13/84	
2. Letter to E.A. Hickok from MPCA requesting modifications to the QA/QC Plan and Safety Plan.	MPCA	6/19/84	

IV. WORKPLAN CORRESPONDENCE			
3. Letter to Kerry Street from Onan stating that the new consultant is Conestoga-Rovers & Ass.	Bruce Borgerding ONAN Corp.	7/27/84	2
4. Letter to WDE from MPCA	Thomas Kalitowski	8/1/84	3
5. Letter to Patricia Lindquist, City Admin. of Andover, Minn. from MPCA regarding the testing of residential water wells.	MPCA		
6. Letter from MPCA to Elldfard Briesemeister Mngr of Manuf., Foley Belsaw	Clifford Anderson MPCA	7/30/84	1
7. Letter from CRA to MPCA regarding sampling changes.	Alan W. VanNorman CRA	8/30/84	3
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V. QAPP (3)			
1. Letter which approves the three QAPP plans.	USEPA Norman R. Niedergang	2/22/87	3
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VI. QA/QC DATA AVAILABLE AT 536 S. Clark Chicago, Ill.			
VII. RI/FS: REMEDIAL INVESTIGATION AND BIBLIOGRAPHY	CRA	3/1986	142 257
VIII. SUPPLEMENTAL REMEDIAL INVESTIGATION	CRA	9/1986	37
IX. DETAILED ANALYSIS REPORT	CRA	10/1986	275
1. This is a final draft of the feasibility study. (also pps. 104-166 have been pulled out and placed in the Public Endangerment file.)			
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XII. ROD NOT AVAILABLE YET.			
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2. Press Release	?	3/23/84	2
3. Letter from Bowman and Bowman to MPCA	David Graves	3/29/85	5
4. Cnty of Anoka to USEPA	Albert Kordiak	1/22/85	2
5. Letter from MPCA to Honorable Albert A. Kordiak, Anoka Cnty. Brd. of Commiss.	T. Kalitowski	2/26/85	3
6. Canonie Engrs to USEPA	Canonie Engrs.	5/24/84	1
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8. News Release	EPA	3/23/84	2
9. MPCA Letter to USEPA	Susan M. Brustman	12/2/83	2
10. Valdas V. Adamkus to Senator Rudy Boschwitz	Valdas Adamkus	11/28/83	3
11. Request for Information from Minneapolis Star Tribune	Kerry Street	11/29/83	4
12. Valdas V. Adamkus to Senator Rudy Boschwitz	Valdas Adamkus	11/15/83	6
13. Valdas V. Adamkus to Senator Rudy Boschwitz	Valdas Adamkus	5/17/83	11
14. Valdas V. Adamkus to Senator Rudy Boschwitz	" " "	5/12/83	3
15. Copy of NPL sent to Irene Lund.	Kerry Street	5/17/83	2
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XV. Additional Items			
1. Comment Letter on DAR from Kerry Street (U.S. EPA) to Alan Van Norman	Kerry Street	8/29/87	7
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6. MPCA Memo on 1/28/87 Sampling of Coon Creek	Michael Convery	2/23/87	15
7. Agenda, Fact Sheet and Press Release for Public Meeting on FS	MPCA and U.S. EPA	9/3/87	5
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RECORD OF DECISION
SELECTED REMEDIAL ALTERNATIVE

Site Name and Location:

West KL Avenue Landfill
Kalamazoo, Michigan

Statement of Basis and Purpose:

This decision document presents the selected remedial action for the West KL Avenue Landfill, located in Kalamazoo, Michigan. The site is on the National Priorities List (NPL). The decision has been developed in accordance with CERCLA, as amended by SARA. This decision is based on the Administrative Record for this site. The Administrative Record Index identifies the items that comprise the Administrative Record, upon which the selection of the remedial action is based. The Administrative Record Index is attached to this Declaration.

The State of Michigan has concurred with the selection of groundwater extraction and treatment and the landfill portions of the selected remedy. However, the State of Michigan does not believe that the use of enhanced bioremediation as the groundwater treatment will meet the cleanup goals as stated within the Record of Decision. To compensate for the State of Michigan's concern, the Record of Decision has been written to have the groundwater treatment portion of the remedy either replaced or supplemented if it is shown during the remedial design phase that enhanced bioremediation will not attain the cleanup goals consistent with Michigan Act 307, Type B cleanup. The letter of concurrence is attached to the ROD package.

Assessment of the Site:

Actual or threatened released of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

Description of the Selected Remedy:

The selected remedy addresses the final remedy for the Site and addresses the principal treats posed by the Site. The selected remedy for the West KL Avenue Landfill is as follows:

Groundwater:

- Limited Action including continued groundwater monitoring, deed restrictions and the proper abandonment of closed residential wells; and

- Groundwater extraction followed by treatment of the groundwater via enhanced bioremediation utilizing fixed film bioreactors would be the selected remedy. The treated groundwater, treated to meet the more stringent of the state and federal applicable or relevant and appropriate requirements (ARARs), would then be injected back into the shallow aquifer, piped to the City of Kalamazoo POTW or discharged into an on-site infiltration pond.

Landfill Contents:

- Limited Action including limiting site access by installing a fence around the perimeter of the site, and by placing deed restrictions on the landfill property; and

- Landfill containment by utilizing a multi-layer RCRA type cap consisting of (from bottom up) a 2-foot clay layer, a 60 mil density polyethylene liner, a 12-inch drainage layer, a geotextile filter fabric, a 2-foot layer of clean fill, all topped by a 6-inch layer of topsoil. Gas venting and monitoring will be incorporated into the cap design.

Declaration:

The selected remedy is protective of human health and the environment, and attains Federal and State requirements that are applicable, or relevant and appropriate, to the remedial action. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this site. The remedy for the West KL Avenue Landfill will utilize treatment as a principal element of the remedy, as per statutory preference, via the groundwater treatment described above.

Because this remedy will result in hazardous substances remaining on-site above health-based levels, a review will be conducted within 5 years after commencement of remedial action, to ensure that the remedy continues to provide adequate protection of human health and the environment.

9/28/90

Date

For Valdas V. Adamkus
Regional Administrator

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RECORD OF DECISION
SUMMARY OF REMEDIAL ALTERNATIVE SELECTION
FOR THE WEST KL AVENUE LANDFILL
OSHTEMO TOWNSHIP
KALAMAZOO, MICHIGAN

I. SITE NAME, LOCATION, AND DESCRIPTION

The West KL Avenue Landfill, also known as the Oshtemo Township Dump or the Kalamazoo County Landfill, is located approximately seven miles west of downtown Kalamazoo, Michigan (Figure 1). The landfill, consisting of approximately 87 acres of land, is situated in a rural-residential area. The closest residents to the landfill are immediately to the southeast and to the southwest of the landfill. Two small lakes, Bonnie Castle Lake, 200 feet northeast, and Dustin Lake, one mile west of the landfill, are the major surface water bodies in the area (Figure 2). The site sits atop two aquifers. The shallow aquifer, a thick (105 to 145 feet) sand and gravel outwash zone, is located 20 to 60 feet below the surface. The deeper aquifer, also a sand and gravel outwash zone, ranges from 10 to 30 feet in thickness. These aquifers are separated by a thick (56 to 179 feet) clay-rich till unit. The two aquifers do not seem to be hydraulically connected in the vicinity of the landfill. Both aquifers provide drinking water to local residents.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

The West KL Avenue Landfill was originally operated by Oshtemo Township as a 20 acre town dump from the early 1960's to 1968. In May 1968, Kalamazoo County leased the site from Oshtemo Township for use as a county-wide landfill. The County purchased the surrounding land on either side of the original dump to form the present 87 acre site. The site was operated by the Kalamazoo County Bureau of Public Works under licenses issued by the MDNR from 1968 through 1974, and continued operation to May 1979 without licensing, at which time it was closed by the MDNR. An estimated five million cubic yards of refuse and an unknown amount of bulk liquid and drummed chemical wastes were disposed of at the landfill. In January 1972 the MDNR notified the County that disposal of chemical wastes at the landfill was unacceptable, yet file information indicates that the wastes continued to be accepted. The exact disposal location(s) of the chemical wastes within the landfill is not known. In February 1976, analytical tests showed that nearby residential wells were contaminated. The MDNR notified the County that no further operating licenses would be granted and the County was to seek an alternative disposal location. In November 1978 and January 1979 the residential wells showed more serious contamination problems. The discovery of volatile organic compound contamination in several wells caused the MDNR to order the landfill to cease operations in May 1979. The MDNR also ordered the County to provide an alternative water source to affected residents and to install an impermeable cover over the landfill. As a result, eleven new residential wells were installed in the deep uncontaminated aquifer for those residents whose wells were affected by contamination and a cap consisting of a 2-foot layer of mixed soil and granular bentonite was placed over areas of the landfill with less than 10 percent slope and in areas where the slope was greater than 10 percent, no bentonite was applied. Kalamazoo County also installed a new water main along West KL Avenue and South 4th Street near the landfill to service the residents requesting hookups.

The West KL Avenue Landfill remains closed and has not received any wastes since May 1979. The surface of the site is vegetated, but small areas are present where vegetative cover is sparse or absent. Ponding of precipitation has occurred in subsidence depressions on the surface of the fill area. Runoff from the east slope of the fill flows into Bonnie Castle Lake and the small adjacent ponds, while runoff from the south slope flows to West KL Avenue. Erosion of the cover has occurred at the site and refuse protrudes above the cover in numerous areas. Leachate flows and seeps are present along the south fill face.

The West KL Avenue Landfill was added to the U.S. EPA National Priorities List (NPL) in December 1982. Releases of hazardous substances from the site to the groundwater was the primary concern of the scoring package.

Notice Letters initiating negotiations for the RI/FS were mailed to Potentially Responsible Parties (PRPs) in three mailings (to over 200 PRPs) from mid to late 1985. After failing to reach an agreement, the U.S. EPA informed the PRPs that the negotiations were concluded on February 19, 1986 and that the RI/FS was to be conducted by the U.S. EPA.

On February 26, 1990, General Notice Letters were sent to approximately 90 Potentially Responsible Parties (PRPs), including waste generators and transporters and the site owners and operators. Special Notice Letters will be issued after this Record of Decision is signed.

III. HIGHLIGHTS OF COMMUNITY PARTICIPATION

A Remedial Investigation/Feasibility Study (RI/FS) public kickoff meeting to explain the start of the Superfund process and the RI work to be performed to the local residents was held on April 28, 1986. Two information repositories were set up to help make pertinent site information available to the public, at the Oshtemo Township Hall and at the Oshtemo Township Branch of the Kalamazoo County Library. During the RI, several updates in the form of letters were sent to the West KL Avenue mailing list, derived from the signup sheet at the public meeting. According to Section 113(k)(1) of CERCLA, the Administrative Record has been made available to the public at the Library.

A public meeting was held on November 20, 1989 to explain the findings of the RI to the public. The Michigan Department of Natural Resources (MDNR) participated in this meeting, as well as at the previous meeting mentioned above.

The Public Comment FS and the Proposed Plan were made available for public comment from June 11, 1990 through August 10, 1990. Two public meetings were held to assist the public in understanding the process of remedy selection. The first was an availability session, held on July 16, 1990 and the second was a public hearing held on July 23, 1990. Comments received during the public comment period and the U.S. EPA's responses to those comments are included in the attached Responsiveness Summary. The provisions of Sections 113(k)(2)(B)(i)-(v) and 117 of CERCLA have been satisfied.

IV. SCOPE AND ROLE OF THE RESPONSE ACTION

The scope of this response action is a final remedy to address the contamination and potential contamination caused by the waste disposed of at the Facility. The response action will address the principal threats caused by the Facility, such as the groundwater contamination (contaminants within the groundwater found above state and federal limits) at and around the Facility. The final remedy will also include the upgrading of the present landfill cap to contain the wastes and to minimize the contaminants reaching the groundwater. Since wastes will remain on site, periodic monitoring will need to be maintained, as well as a review of site conditions at least once every 5 years. The U.S. EPA has developed an approach to remediation which is addressed in this ROD and has determined that unless there is remediation at this Facility, there will continue to be actual and/or potential imminent and substantial endangerment to human health, welfare or the environment. The scope of the remedial action at the Facility is to achieve compliance with federal and state ARARs (Applicable or Relevant and Appropriate Requirements) regarding groundwater contamination and the containment of wastes at the site to prevent further releases at the Facility.

V. SUMMARY OF SITE CHARACTERISTICS

The RI and FS Reports have adequately described the current conditions of the West KL Avenue Landfill. The Final RI Report was submitted to the U.S. EPA by their contractor in May 1989 and the Public Comment FS was submitted to the U.S. EPA in March 1990. Field work for the RI was conducted in three phases and began in September 1986 and finished in January 1989. The RI consisted of the installation of monitoring wells, the sampling of monitoring and residential wells, soils, sediment, surface water, and air, a geophysical survey and the digging of test pits in search of buried drums. The RI Report should be referenced for details involving the components of the RI.

A summary of the conclusions of the RI Report is as follows:

- Scattered organic compound contamination is present in surface soils near leachate seeps and non-vegetated areas.

- Two locations of PCB contamination were found on the landfill. At both locations, PCB concentrations were between 180 and 700 parts per billion (ppb).

- No contamination that can be attributed to the landfill was found in surface water and sediments (from Bonnie Castle and Dustin Lakes and nearby smaller ponds).

* Sporadically occurring organic compound contamination was found in subsurface soils. These contaminant concentrations did not correlate with contaminant levels in groundwater samples taken from monitoring wells at the same locations.

* Groundwater flow in the shallow aquifer is to the west and northwest from the landfill, which is consistent with regional flow patterns.

* Contamination originating from the landfill has affected the shallow aquifer. Volatile and semi-volatile organic compounds were found in this aquifer only. Examples of the concentrations found in the shallow aquifer are found in Table 1. No indication of contamination in the deeper aquifer was found.

* No inorganic contaminants in filtered groundwater exceeding primary drinking water standards were found. (Filtered samples provide results generally more indicative of dissolved components of groundwater; refer to the RI Report for further clarification of the two.) Filtered inorganic sample results are listed in Table 2. Table 1 shows the concentrations of inorganic compounds found in the unfiltered samples. These are the values that were utilized in the Risk Assessment since the use of the unfiltered sample data contributes to a more conservative approach to the risk assessment due to the generally higher values measured in the unfiltered samples (Refer to the Risk Assessment for further clarification).

* The groundwater contaminant plume in the shallow aquifer extends to the west and northwest from the landfill (Figure 3). The highest concentrations are generally located across the central part of the landfill. Contaminant concentrations decrease gradually to the southwest and northwest and rapidly to the north, east, and south.

* The transport of contaminants was observed to be much slower than estimated by an analytical model used to calculate the effects of adsorption on the plume's migration. This discrepancy may best be explained by biodegradation, both aerobic and anaerobic, occurring in the contaminant plume. Anaerobic conditions in the core of the plume promote the degradation of PCE, TCE and TCA into 1,1 DCA and 1,2 DCE, which are found in higher concentrations there. Aerobic biodegradation may be occurring near the margins of the plume where oxygen is available. This may account for the observed pattern of non-chlorinated compounds, which are in high concentrations in the plume's interior, rapidly decreasing in concentration near the plume margins.

* Owing to the depths to groundwater in the shallow aquifer and supported by file information, the landfill contents are not believed to be in the groundwater.

TABLE 1

CHEMICALS OF POTENTIAL CONCERN IN SHALLOW AQUIFER MONITORING WELL SAMPLES OF GROUNDWATER AT THE WEST KL LANDFILL, PHASE I ROUNDS I AND II AND PHASE II (a)

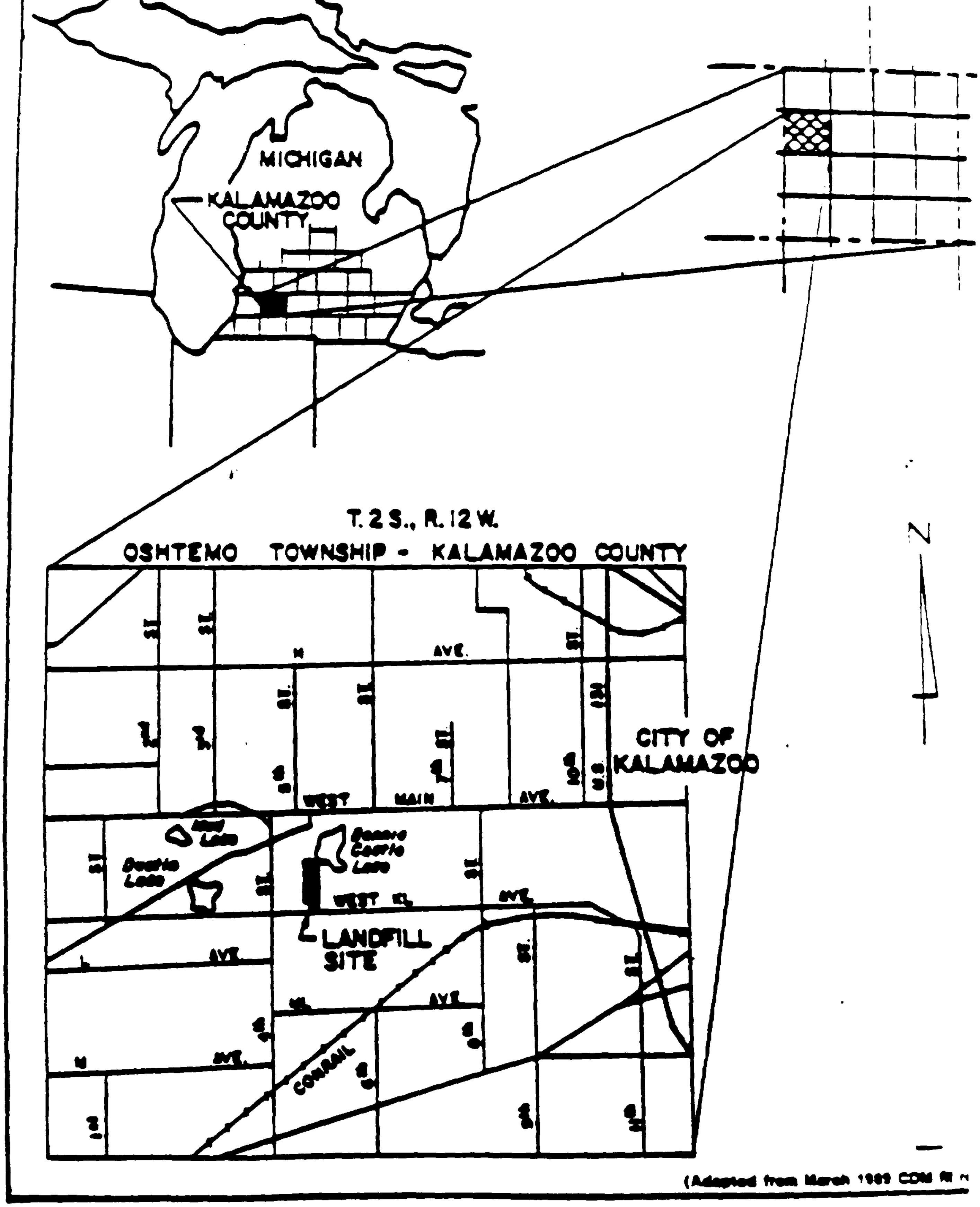
Chemicals	Frequency of Detection (b)	Geometric Mean Concentration (ug/L)	Maximum Concentration (ug/L)
Vinyl chloride	5/41	5.9	107
Chloroethane	10/41	6.3	100
1,1-Dichloroethane	26/41	23	1,200
1,2-Dichloroethene	15/41	6.6	200
trans-1,2-Dichloroethene	9/41	3.9	46
Acetone	27/41	100	36,000
4-Methyl-2-pentanone	22/41	35	1,700
2-Butanone	17/40	32	4,700
Benzene	24/41	13	720
Toluene	16/41	5.6	1,300
Xylene	5/41	3.5	58
Ethylbenzene	8/41	3.1	46
2-Hexanone	3/41	5.6	85
Phenol	11/40	9.1	1,400
4-Methylphenol	12/40	13	4,200
Benzoic acid	10/40	32	15,000
Barium	38/41	115	1,010
Cadmium	18/41	6.8	384
Chromium	14/41	6.2	136
Lead	33/41	18	900
Manganese	38/41	150	743
Iron	40/41	2,730	37,000
Nickel	15/41	12	66
Zinc	41/41	3,300	120,000

(a) Sample identification: MW1, MW2, MW3, MW7, MW9 through MW16, TW2 through TW5, RE2 through RE5, RE7.

(b) Number of samples in which the chemical was detected over the total number of samples analyzed.

FIGURE 1

LOCATION OF WEST KL AVENUE LANDFILL SITE



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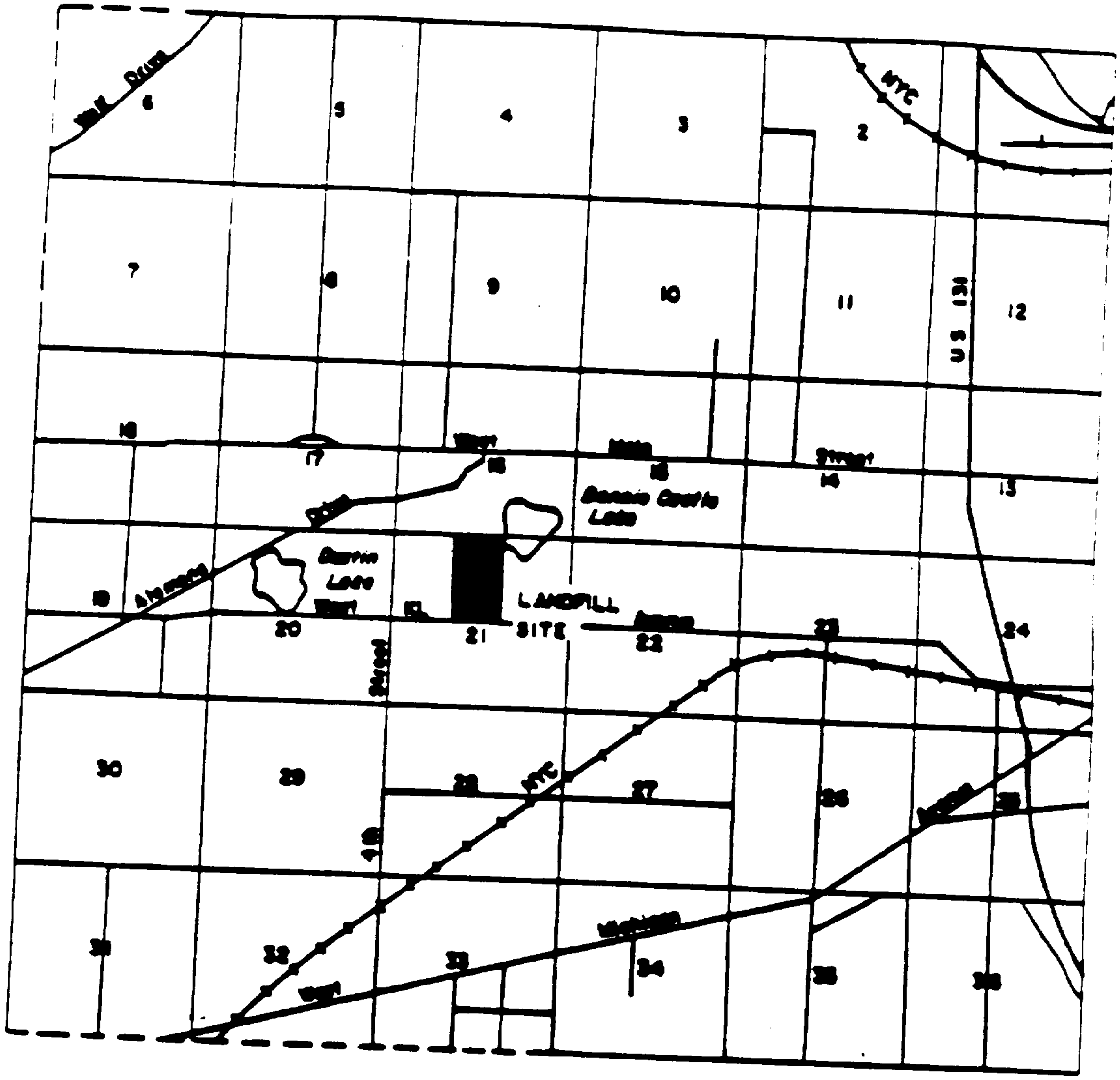

FIG. 2

LOCATION OF
WEST KL AVENUE LANDFILL
OSHTEMO TOWNSHIP

N

SCALE

0 1 2 miles

TABLE 2

SUMMARY OF [illegible] GROUNDWATER SAMPLING RESULTS: INORGANICS

CONSTITUENTS	INVESTIGATIVE SAMPLES(a) No. of positive detections / No. of observations	INVESTIGATIVE SAMPLES(a) Range of Detection	BACKGROUND SAMPLES(b) No. of positive detections / No. of observations	BACKGROUND SAMPLES(b) Range of Detection	STATE AND FEDERAL PRIMARY CONTAMINANT LEVELS	FEDERAL PRIMARY CONTAMINANT LEVEL GOALS	FEDERAL SECONDARY DRINKING WATER STANDARDS	FEDERAL DRINKING WATER HEALTH ADVISORY FOR LIFETIME EXPOSURE	FEDERAL AMBIENT WATER QUALITY ADJUSTED FOR DRINKING WATER(d)	MONITORING WELLS EXCEEDING GROUND WATER STANDARDS
Aluminum	1/21	ND	0/5	ND						
Arsenic	4/21	4.4-12.4	0/5	ND						
Barium	19/21	15.3-730	5/5	27-65	1,000	1,500(d)		1,500		
Cadmium	2/21	4.4-6.2	0/5	ND	10	5(d)		5		[illegible]
Calcium	20/21	1,330-60,300	5/5	13,700-207,000						
Chromium	3/21	3.9-16.1	3/5	9.9-10.4	50	100		120		
Copper	0/21	ND	0/5	ND						
Iron	16/21	40-4000	3/5	40.9-48.1			300			[illegible]
Lead	3/21	1.6-3.0	3/5	2.3-4.6	50(30)	20(d)(40(d))			50	
Magnesium	18/21	20.2-107,000	5/5	10,000-28,500						
Manganese	18/21	21-600	4/5	20.5-66.6			50			(1) (2)
Mercury	0/21	ND	0/5	ND						
Nickel	6/21	13.0-42.9	0/5	ND						
Potassium	14/21	1,000-10,000	3/5	1,530-25,000						
Selenium	0/21	ND	0/5	ND						
Silver	3/21	7.3-14	3/5	7.1-9.4						
Sodium	18/21	2,000-56,100	4/5	8,400-304,000						
	0/21	ND	0/5	ND						Thallium
Zinc	18/21	41.2-3,300	5/5	101-8,100			5,000		5,000	[illegible]
Antimony	1/21	67.6	0/5	ND						
TDS mg/l	21/21	102-1,600	5/5	170-238			500			(3)

Footnotes

a) Investigative Samples: [illegible]

b) Background Samples: [illegible]

d) Proposed criteria

1) [illegible]

2) [illegible]

3) [illegible]

ND) Not Detected

NOTE: Results from unfiltered samples are not included on this table.
All units are parts per billion (ppb).

[illegible]

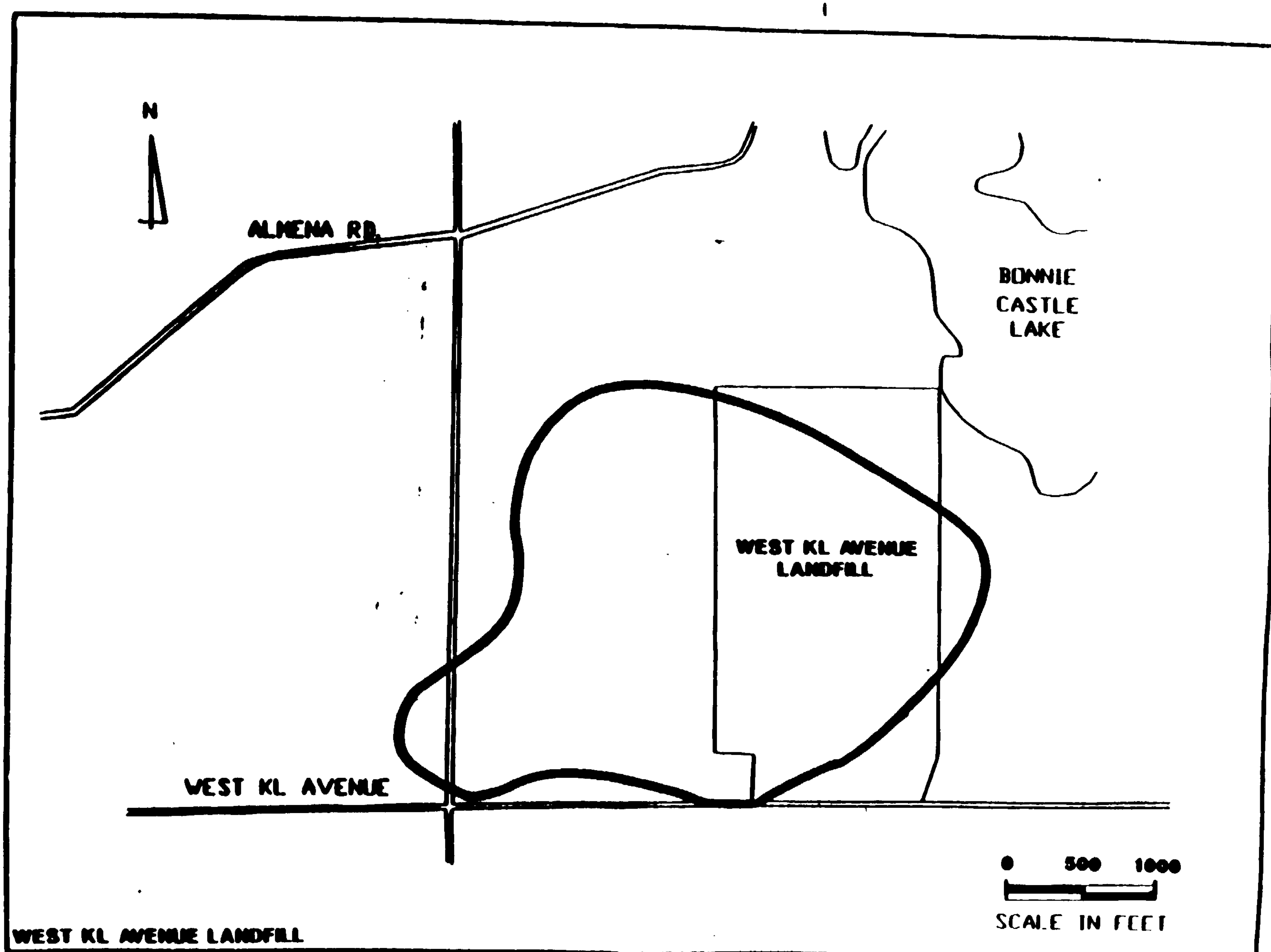

FIGURE 3
APPROXIMATE BOUNDARIES OF CONTAMINANT PLUME

- The results of the air sampling conducted near the landfill vents and in the ambient air around the landfill have shown low ppb levels of several organic compounds, the highest concentrations being found near the vents. Toluene, benzene and acetone were the compounds most often detected, and at the highest concentrations. There was no clear trend of higher concentrations downwind and during-excavation samples than in upwind or pre-excavation samples.

- The test pit investigation strongly suggests that the landfill is the source of contaminants found in soils and groundwater near the landfill. The constituents found in both the test pits and air samples (source samples) and in groundwater are acetone, benzene, ethylbenzene, toluene, xylenes, chlorinated organics, phenols, and of number of inorganics. Only a few single drums were discovered during the test pit operations. The one full drum that was sampled appeared to be a grease type material and contained acetone, toluene, ethylbenzene and xylene. No areas of heavily concentrated drums or other contaminated materials, indicating potential "hot spots" were found through the test pit operation.

VI. SUMMARY OF SITE RISKS

CERCLA requires that U.S. EPA protect human health and the environment from current and potential exposure to hazardous substances found at the Facility. The RI Report contains a Risk Assessment which characterizes the nature and estimates the magnitude of potential and/or actual risks to public health and the environment caused by the contaminants identified at the Facility. A summary of the findings of the Risk Assessment is as follows:

A. CONTAMINANTS OF CONCERN

Chemicals identified as chemicals of potential concern and used in the risk assessment consisted of a variety of organics and inorganics. In total, 34 organic and 8 inorganic chemicals of potential concern were identified in one or more environmental media and were evaluated in the risk assessment (Table 3). These compounds have been used to evaluate toxicity, exposure pathways and potential health risks for individuals residing near the landfill or workers/trespassers on the landfill.

B. EXPOSURE ASSESSMENT

Potential pathways of exposure to contaminants originating from the West KL Landfill site under current and future land use conditions include contacts with the air and soil, on and around the site, utilization of the shallow aquifer for drinking water, and the uses of the surrounding ponds and lakes. These pathways were evaluated within the RI's Risk Assessment as to what risks to human health or the environment were or could potentially be present. These are summarized in the following sections.

TABLE 3

CHEMICALS OF POTENTIAL CONCERN CHOSEN BY CDM FOR THE WEST KL LANDFILL SITE, MICHIGAN

Chemical	Surface Soil	Subsurface Soil	Groundwater	Sediment	Air (a)
Organics					
Acetone	X	X	X		X
Benzene			X		X
Benzoic acid	X		X		
Bis(2-ethylhexyl)phthalate		X			
Bromomethane					X
2-Butanone			X		X
Butylbenzylphthalate	X				
Carbon disulfide					X
Carbon tetrachloride					X
Chloroethane			X		
Chloroform					X
Dibenzofuran	X				
1,4-Dichlorobenzene	X				
1,1-Dichloroethane			X		X
1,2-Dichloroethane			X		
1,2-Dichloroethene			X		X
Diethylphthalate	X	X			
Di-n-butylphthalate				X	
Ethylbenzene	X		X		X
2-Hexanone		X	X		
Methylene chloride				X	X
4-Methyl-2-pentanone			X		
4-Methylphenol	X		X	X	
PAHs	X			X	
PCBs	X				
Pentachlorophenol		X			
Phenol			X		
Tetrachloroethene					X
Toluene	X		X		X
1,1,1-Trichloroethane					X
Trichloroethene					X
Vinyl acetate					X
Vinyl chloride			X		
Xylene	X		X		X
Inorganics					
Barium			X		
Cadmium			X		
Chromium			X		
Iron			X		
Lead			X		
Manganese			X		
Nickel			X		
Zinc			X		

(a) Represents all chemicals detected near gas vents or downwind of the landfill (i.e., no selection of chemicals was performed). As discussed in the text, it is not possible to determine site-relatedness from available data.

TABLE 4

SUMMARY OF RISKS

Scenario	Total Upperbound Lifetime Excess Cancer Risks: Average	Total Upperbound Lifetime Excess Cancer Risks: Plausible Maximum	Hazard Index: Average	Hazard Index: Plausible Maximum
Current Land-Use Scenarios				
Direct Contact with Surface Soil -				
Children - landfill	1E-08	2E-08	<1	<1
Children - possible dumps	NC	6E-07	<1	<1
Direct Contact with Sediments -				
Children - collection ponds	2E-14	8E-13	<1	<1
Children - Dustin Lake	4E-14	1E-07	<1	<1
Children - Bonnie Castle Lake	2E-14	8E-08	<1	<1
Inhalation of Ambient Dusts -				
Trespassers - landfill	7E-11	3E-10	<1	<1
Residents - nearby	9E-10	1E-08	<1	<1
Inhalation of Volatiles -				
Trespassers - landfill	9E-08	4E-07	<1	<1
Residents - nearby	2E-06	2E-05	<1	<1
Inhalation of Dusts Generated by Dirt Bikers -				
Dirt Bikers - landfill	2E-13	7E-12	<1	<1
Inhalation of Volatiles by Dirt Bikers				
Dirt Bikers - landfill	2E-06	1E-04	<1	<1
Future Land-Use Scenarios				
Ingestion of Groundwater -				
Residents	5E-04	1E-02	2	100
Direct Contact with Surface Soils -				
Residents	2E-08	7E-06	<1	<1

NC = Not calculated.

C. TOXICITY ASSESSMENT

Using data generated during the RI, the U.S. EPA conducted a site-specific baseline risk assessment to characterize the current threat to human health and the environment for each of the actual or potential exposure pathways discussed in Section B above.

Toxic substances may pose certain types of hazards to human and animal populations. Typically, hazards to human health are expressed as carcinogenic and non-carcinogenic toxic effects. Carcinogenic risk, numerically presented as an exponential factor (e.g., $1x10^{-6}$), is the increased chance a person may have in contracting cancer in his or her lifetime. For example, a $1x10^{-6}$ risk due to a lifetime of drinking water that contains the contaminants of concern means that a person's chance of contracting cancer is increased by 1 in 1 million. The U.S. EPA attempts to reduce risks at Superfund sites to a range of $1x10^{-4}$ to $1x10^{-6}$ (1 in 10,000 to 1 in 1 million), with emphasis on the lower end ($1x10^{-6}$) of the scale. The Hazard Index (HI) is an expression of non-carcinogenic toxic effects and measures whether a person is being exposed to adverse levels of non-carcinogens. Any HI value of greater than 1.0 suggests that a non-carcinogen presents a potentially unacceptable toxic effect.

Based on toxicological studies of the contaminants of concern found in the groundwater at and near the Facility, several are classified as being carcinogens. Carcinogens found in the groundwater include benzene and vinyl chloride, classified as Group A - Human Carcinogens, and 1,1-Dichloroethane, 1,2-Dichloroethane and Lead, classified as Group B2 - Probable Human Carcinogens. The rest of the contaminants of concern found in the groundwater are non-carcinogenic. Carcinogens found in and near the gas vents on-site include benzene, Group A - Human Carcinogen, and carbon tetrachloride. chloroform, methylene chloride, tetrachloroethene, and trichloroethene, all Group B - Probable Human Carcinogens.

D. SUMMARY OF RISK CHARACTERIZATION

A summary of the risks associated with the contaminants of concern found at the West KL Avenue Landfill is found in Table 4. This table shows that the average excess cancer risk associated with the drinking of the groundwater is $5x10^{-4}$, with a maximum risk of $1x10^{-2}$. Also, the HI value is found to have an average value of 2, with a maximum value of 100. (See the Risk Assessment within the RI Report for details and driving forces behind the risk levels.) The health risks associated with the other pathways are within the acceptable risk ranges. The values for the exposure via inhalation of volatiles by residents and dirt bikers are near unacceptable levels, but these issues will be indirectly addressed through the containment (capping of the landfill) and the land use restrictions of the selected remedy.

E. ENVIRONMENTAL RISKS

The effects of the contamination on the environment were evaluated using potential exposures to PCBs and PAHs. The results are as follows (it should be noted that there are many uncertainties associated with these estimates of risk, please refer to the risk assessment portion of the RI Report): 1) The levels of PCBs in the surface soils of the landfill cover are at concentrations below those associated with phytotoxic effects in some species of plants. Impacts on vegetation at the site from exposure to PCBs are believed not to be occurring. Other chemicals of potential concern in the soils of the site may be impacting vegetation, but given the relatively low concentrations of these other organic chemicals in the surface soils of the site, impacts on the vegetation of the area are not expected; 2) The estimated PCBs intake by robins and shrews exceeds the toxicity values derived for these species, therefore reproductive effects in some members of the population may be occurring (if the assumed conditions are assumed to be true). However, such effects may be expected to have negligible impact on the area's population of robins and shrews, given the likely small numbers of individuals of these species using or inhabiting the landfill and considering that reduced reproduction in a few members of any population will have inconsequential effects (in an ecological sense) on the reproduction of the population as a whole; and 3) The concentrations of PAHs in the sediments of Bonnie Castle and Dustin Lakes are well below those estimated to be associated with toxic effects in benthic species. Based on this comparison, PAHs in the sediments of the area's lakes are not at concentrations sufficient to impact aquatic life.

VII. DESCRIPTION OF ALTERNATIVES

The FS, based on the findings of the RI and the Risk Assessment, has identified and evaluated an array of remedial alternatives. This section describes identified remedial alternatives and Section VIII below compares the identified alternatives that could be used to mitigate or correct the contamination problems at the Facility. As discussed in more detail in Section VIII below, the comparison of alternatives is based on nine criteria. One of the threshold criteria is satisfaction of applicable or relevant and appropriate requirements (ARARs), such as Federal and State regulations governing the proposed alternative. The alternatives have been separated into two categories: 1) Groundwater (GW) Alternatives that address the contaminated groundwater at and near the site, and 2) Landfill (LF) Alternatives that address the source of the contamination, the landfill. The alternatives considered for the Facility are presented within the FS and are summarized below. In the FS, certain remedial alternatives were eliminated from further consideration due to the technical and administrative infeasibility of implementing the alternative, and/or due to the grossly excessive cost compared to the overall effectiveness of the alternative (such as excavating, treating and redepositing all the wastes in the landfill); pursuant to the NCP at 40 CFR 300.430(e)(7). For a more detailed description of the alternatives, please refer to the FS Report.

A. DESCRIPTION OF GROUNDWATER (GW) ALTERNATIVES

Alternative GW #1: No Action

The No Action alternative is mandated by the NCP to be carried through to the remedial action selection process in order to provide a baseline comparison with other alternatives. Under this alternative, no remedial action or treatment would be taken at the West KL Avenue Landfill site. Therefore, the potential human health risks (as summarized above and within the Risk Assessment) due to ingestion of contaminated groundwater at the site would continue. ARARs regarding groundwater contamination would not be met.

Estimated Construction Cost: not applicable
Estimated Total O&M Costs: not applicable
Estimated Total Present Worth: not applicable
Estimated Implementation Timeframe: not applicable

Alternative GW #2: Limited Action

This alternative involves continued monitoring of wells (residential and monitoring wells) to characterize the groundwater contaminant plume. No groundwater remediation or treatment is performed. Deed restrictions (restricting the use of the shallow aquifer as a drinking water source, at least until the clean-up goals are achieved) and residential well closures (the proper closure of the abandoned residential wells as well as any other residential well that may become affected by the contamination) are used as the main mechanisms for eliminating the potential groundwater exposure pathway. The provisions of this alternative can be implemented alone or in conjunction with other groundwater remedial alternatives. ARARs regarding groundwater contamination would not be met.

Estimated Construction Cost: $4,200
Estimated Total O&M Costs: $141,400
Estimated Total Present Worth: $145,600
Estimated Implementation Timeframe: 1 year, with 30 years of monitoring

Alternative GW #3: Collection and On-Site Treatment Alternatives

This alternative calls for the collection of contaminated groundwater followed by on-site treatment of the collected water. The groundwater downgradient of the site needs to be pumped and treated until the clean-up levels are met. The clean-up levels are to be dictated by federal and state ARARs. (Table 5 shows the cleanup levels for the primary contaminants of concern at this Facility.) Groundwater treatment will be required to reduce the risk levels from the present high risk levels ($1x10^{-2}$ and an HI value of 100) to the risk levels of $1x10^{-6}$ and HI value of less than 1. No matter which groundwater treatment alternative is chosen, air emissions from the treatment unit(s) must comply with ARARs. Any sludges or residuals resulting from on-site treatment will need to be tested to determine whether they exhibit the RCRA toxicity characteristics for constituents regulated by the Land Disposal Restrictions (LDRs). LDR notification and certification requirements (and manifesting requirements) will be met to ship any characteristic wastes off-site. The off-site treatment and disposal facility will treat and dispose of the wastes in accordance with RCRA Subtitle C requirements, including LDR as per 40 CFR 268. The FS Report

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TABLE 5
CLEANUP LEVELS FOR GROUNDWATER
WEST KL AVENUE LANDFILL
(ppb)

Contaminant	MCL	MCLG	Michigan Act 307	Clean-up Goal
Acetone			700	700
Barium	5000	5000	5000	5000
* Benzene	5.0	0	1.0	1.0
2-Butanone			350	350
Cadmium	5	5	4.0	4.0
Chromium (total)	100	100	35	35
1,1-Dichloroethane			700	700
* 1,2-Dichloroethane	5.0	0	0.4	0.4
Trans-1,2-DCE	100	100	140	100
Ethylbenzene	700	700	30	30
Iron	300+		300+	300
* Lead	50	0	5.0	5.0
4-Methyl-2-pentanone			350	350
Nickel	100	100		100
Phenol			300+	300
Toluene	2000	2000	40	40
* Vinyl Chloride	2.0	0	0.02	0.02
Xylenes	10,000	10,000	20	20

* = carcinogen
MCL = Federal Safe Drinking Water Act, Maximum Contaminant Level
MCLG = Maximum Contaminant Level Goal
Act 307 = Michigan's Act 307, Type B, $1x10^{-6}$ Levels or Human Life Cycle Safe Concentration Levels
\+ = Secondary MCL

This chart is not conclusive, as it represents only the contaminants identified as the contaminants of primary concern at the time the RI was conducted.

If the best available detection limit is higher than the Clean-up Goal, then the detection limit will replace the stated Clean-up Goal.

If the background concentration is higher than the Clean-up Goal, as determined by the EPA in consultation with the MDNR, then the background concentration will replace the stated Clean-up Goal.

Other compounds detected, for which there are no health criteria or guidance, will have Clean-up Goals set at a technical performance based clean-up level.

estimates that a maximum pumping rate of approximately 2000 gallons per minute (gpm) will be required to capture the contamination plume, utilizing a minimum of 5 extraction wells, (the exact number of wells, gpm and location of the wells, to ensure that the wells' cones of depression overlap with each other and therefore capture the plume, will be determined during the Remedial Design phase). Treatability Studies will need to be conducted for which ever groundwater remedial action alternative is chosen to verify the effectiveness of the selected treatment method. Alternative GW #3 is divided into four alternatives reflecting different treatment technologies and combinations of these technologies that can best address the needs of the remedial action at this site. The alternatives are as follows:

Alternative GW #3a: Groundwater Treatment Utilizing Precipitation, Air Stripping and Carbon Adsorption

This alternative consists of groundwater collection, as mentioned above, combined with treatment of the extracted groundwater consisting of chemical precipitation, air stripping, and carbon adsorption (Figure 4). The chemical precipitation process will remove the inorganic contaminants to non-detect levels or near non-detect levels. The air-stripping process will remove the organic contaminants of concern to non-detect levels with the exception of several organics. The carbon adsorption process will remove the remaining organic contaminants which were not removed from the groundwater during air stripping.

The limiting design factor for the air-stripping and carbon adsorption systems is the requirement that the ketones be removed to non-detect levels. Because these compounds are neither readily strippable nor adsorbed, the sizes of the air stripper and activated carbon system must be increased significantly to remove the ketones. Groundwater ARARs will be obtained with this alternative if the ketones are removed. ARARs regarding air emissions will be addressed with carbon filters, if required.

Waste products will be generated from this treatment process, including sludges from the precipitation process, air emissions from the air stripper that may need to be captured, and spent carbon that will need to be regenerated or disposed of at an approved RCRA facility.

Estimated Construction Cost: $6,406,400
Estimated Total O&M Costs: $17,783,800
Estimated Total Present Worth: $24,190,200
Estimated Implementation Timeframe: Minimum of 6 years

Sub-Alternative GW #3a: Groundwater Treatment Utilizing Precipitation, Air-Stripping and Carbon Adsorption

The sub-alternative is exactly like GW #3a above except this sub-alternative does not provide the degree of ketone removal as does GW #3a, therefore using significantly less activated carbon. Waste products will be similar to GW #3a, but less activated carbon will be spent and needed to be regenerated or disposed of at an approved RCRA

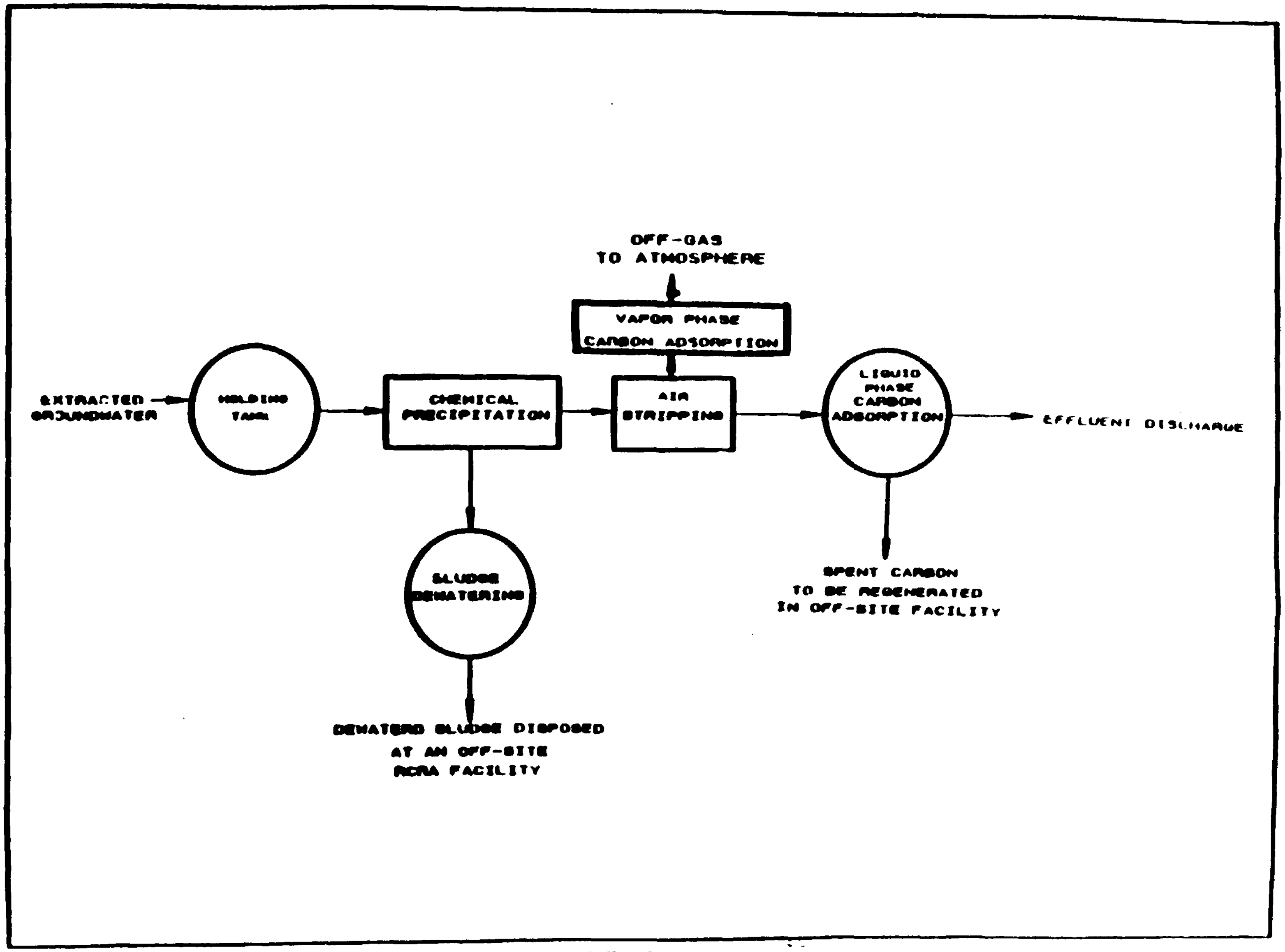

FIGURE 4
TREATMENT SCHEMATIC
FOR GROUNDWATER ALTERNATIVE 3B

facility. Groundwater ARARs may not be achieved since ketones will not be significantly removed. ARARs regarding air emissions will be addressed with carbon filters, if required.

Estimated Construction Cost: $5,829,700
Estimated Total O&M Costs: $5,153,500
Estimated Total Present Worth: $10,982,500
Estimated Implementation Timeframe: Minimum of 6 years

Alternative GW #3b: Groundwater Treatment Utilizing Precipitation, Steam-Stripping and Carbon Adsorption

This alternative consists of chemical precipitation, steam-stripping and carbon adsorption (Figure 5). The chemical precipitation process will remove the inorganic contaminants to non-detect levels. The steam strippers will remove the organic contaminants of concern to non-detect levels with the exception of phenol and 4-methylphenol. The size of the carbon adsorption system in this alternative is assumed to be of similar size as the one needed for sub-alternative GW #3a. This carbon adsorption process will adsorb the contaminants not removed by steam stripping, specifically phenol and 4-methylphenol. This alternative will achieve groundwater ARARs. ARARs regarding air emissions will also be addressed with the use of a carbon filter system, if it is determined that it is necessary.

Waste products will be similar to Sub-alternative GW #3a.

Estimated Construction Cost: $7,011,500
Estimated Total O&M Costs: $6,715,300
Estimated Total Present Worth: $13,726,800
Estimated Implementation Timeframe: Minimum of 6 years

Alternative GW #3c: Groundwater Treatment Utilizing Precipitation and Carbon Adsorption

This alternative consists of chemical precipitation and carbon adsorption (Figure 6). The chemical process will remove the inorganic contaminants to non-detect levels, while the carbon adsorption process will remove the organic contaminants of concern to non-detect levels. This alternative differs from GW #3a and #3b in that it utilizes carbon adsorp

Alternative GW #3d: Groundwater Treatment Utilizing Precipitation and UV-enhanced Oxidation.

This alternative consists of chemical precipitation and UV-enhanced oxidation (Figure 7). The chemical precipitation process will remove the inorganic contaminants to non-detect levels. The UV-enhanced oxidation process will remove the organic contaminants of concern to non-detect levels with the exception of 4-methyl-2-pentanone, which will be removed to a concentration of approximately 10 parts per billion. Groundwater ARARs should be achieved, but depend on the final concentration of 4-methyl-2-pentanone remaining after treatment. ARARs regarding air emissions will be achieved.

Waste products of this alternative include only the sludges from the chemical precipitation.

Estimated Construction Cost: $5,943,200
Estimated Total O&M Costs: $6,870,400
Estimated Total Present Worth: $12,813,600
Estimated Implementation Timeframe: minimum of 6 years

The above groundwater treatment alternatives (GW #'s 3a-d) all include 5 to 7 extraction wells (as described within the FS Report) but other factors which affect implementation of the alternatives include: 1) determining the location of the extraction wells; 2) determining the final disposition of the treated groundwater; and 3) determining the location of the treatment facilities. The exact number and location of the extraction wells will need to be determined during the Remedial Design phase of the project, after a pilot test is conducted. The FS Report discusses possible options on what to do with the large volumes of treated groundwater. Options that were discounted for reasons explained within the FS include: 1) discharge to Bonnie Castle Lake; and 2) shipment to an off-site RCRA facility. The methods that were brought through the FS evaluations were the re-injection of the treated effluent into the shallow aquifer, the construction of a receiving pond, and the extension of the municipal sewer line and the use of the local Publicly Owned Treatment Works (POTW), as in Alternative GW #4a below. The exact numbers and locations of the injection wells would need to be determined during the Remedial Design stage of the project. A preliminary layout of the groundwater extraction system is sketched in Figure 8. The feasibility and size of a receiving pond can not be fully determined until the exact pumpage rate of the extraction wells is known and therefore this option is not carried any further in this ROD, but may still be a viable discharge option. The location of the treatment facilities will be somewhat dependent on the final locations of the extraction and injection wells or the receiving pond. The potential need to purchase or lease private property will most likely elevate the costs of the groundwater treatment alternatives, based on the locations chosen for the extraction wells, the injection wells, the receiving pond, the associated piping, and the treatment facilities. The use of the local POTW will depend on the capacity of the nearest sewer line, the capacity and approval for use of the POTW, the POTW's record of compliance and compliance with the POTW's pretreatment standards. (See Alternative GW #4a below). Whether the POTW is

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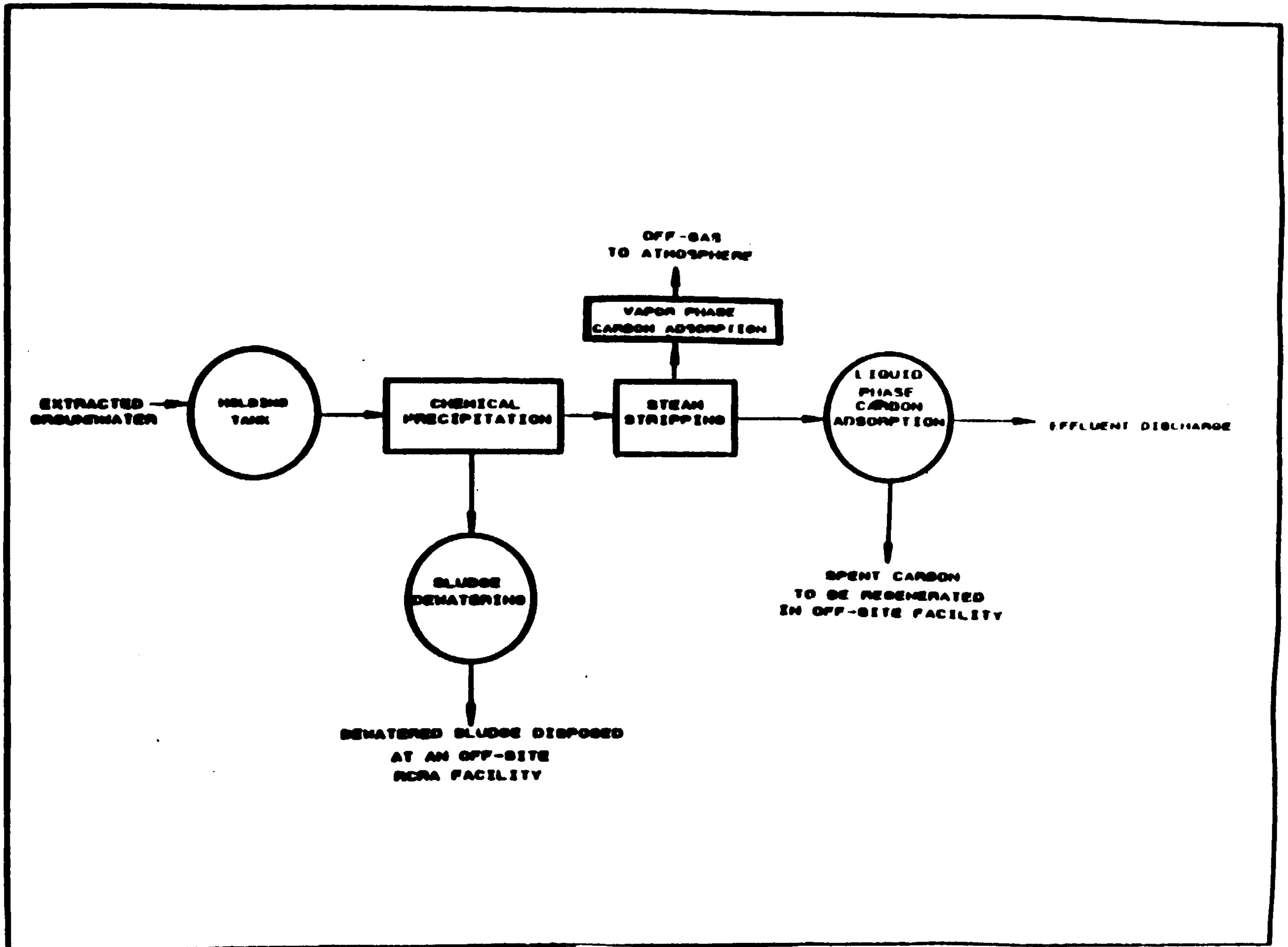

FIGURE 5

TREATMENT SCHEMATIC

( )R GROUNDWATER ALTERNATIVE

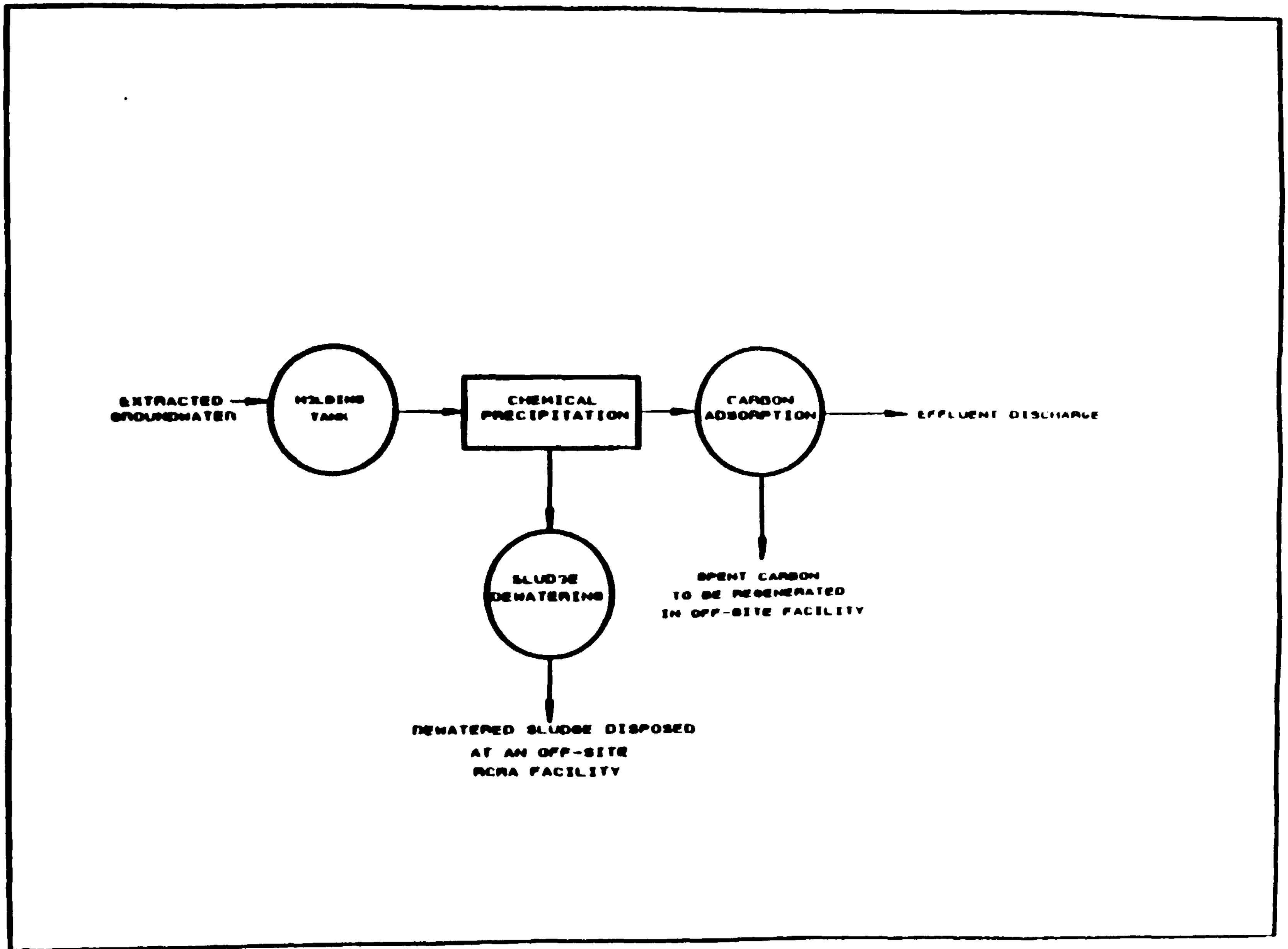

FIGURE 6
TREATMENT SCHEMATIC
FOR GROUNDWATER ALTERNATIVE 3c

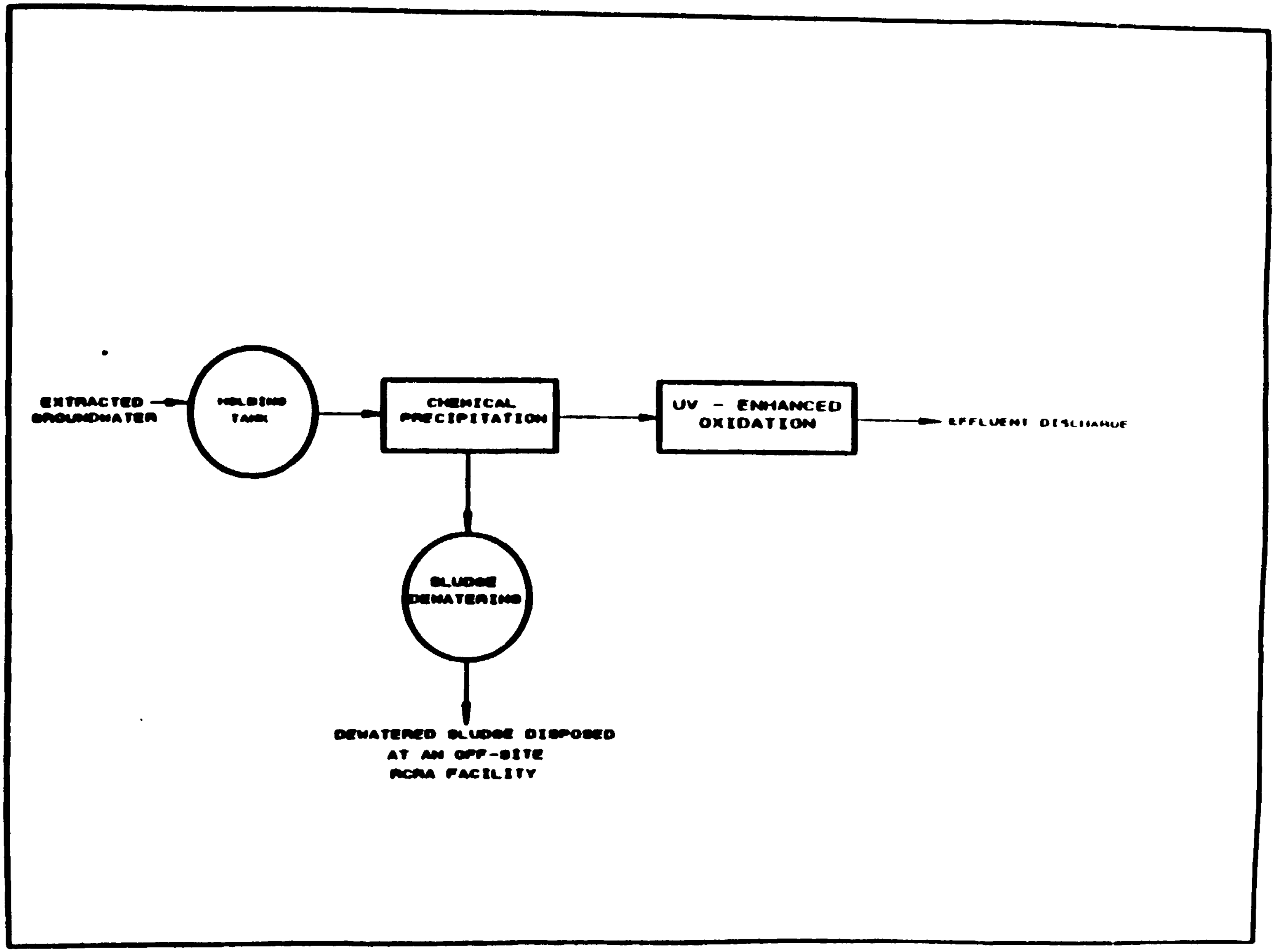

FIGURE 7
TREATMENT SCHEMATIC
FOR GROUNDWATER ALTERNATIVE 3d

used or other surface water discharge options are developed, the treatment requirements will be the same; meeting federal and state surface water quality standards. Any discharges/reinjection to the groundwater will need to have contaminants treated to ARAR cleanup levels. The overall costs of the GW alternatives will be dependent on which method of disposal of the pumped/treated groundwater is chosen.

Alternative GW #4a: Off-Site Treatment at the Kalamazoo POTW.

This alternative consists of extending the City of Kalamazoo's sewer lines to the Site and directly discharging the pumped groundwater (utilizing the extraction wells mentioned earlier) into the sewer system for treatment at the City of Kalamazoo POTW. A sewer line will have to be constructed to connect the extraction well system at the Site to the existing sewer system, which presently ends near 11th Street, approximately 3.25 miles to the east of the Site (Figure 9). Pretreatment to the levels established by the POTW will be required prior to discharge to the sewer/POTW. Cost figures below assume no pretreatment is necessary. The estimated quantity of groundwater discharged to the POTW is 2-3 million gallons per day. Groundwater ARARs will be achieved and ARARs regarding surface water discharges will be accomplished by the POTW meeting their NPDES permit requirements.

Estimated Construction Cost: $2,592,300
Estimated Total O&M Costs: $6,735,400
Estimated Total Present Worth: $9,327,700
Estimated Implementation Timeframe: 6 years

B. DESCRIPTION OF LANDFILL (LF) ALTERNATIVES

Alternative LF #1: No Action

The No Action alternative is mandated by the NCP to be carried through to the remedial action selection process in order to provide a baseline comparison with other alternatives. Under this alternative, no remedial action would be taken at the West KL Avenue Landfill site. Therefore, the potential human health risks (as summarized above and within the Risk Assessment) associated with exposure to landfill contaminants (waste materials have been observed protruding through the present landfill surface) would not be mitigated and would most likely increase as site conditions deteriorate. ARARs regarding landfill closure will not be achieved.

Estimated Construction Cost: not applicable
Estimated Total O&M Costs: not applicable
Estimated Total Present Worth: not applicable
Estimated Implementation Timeframe: not applicable

Alternative LF #2: Limited Action

The Limited Action alternative involves measures designed to limit access to the site and to reduce exposure to landfill contaminants. This will be achieved by constructing a six-foot chain link fence

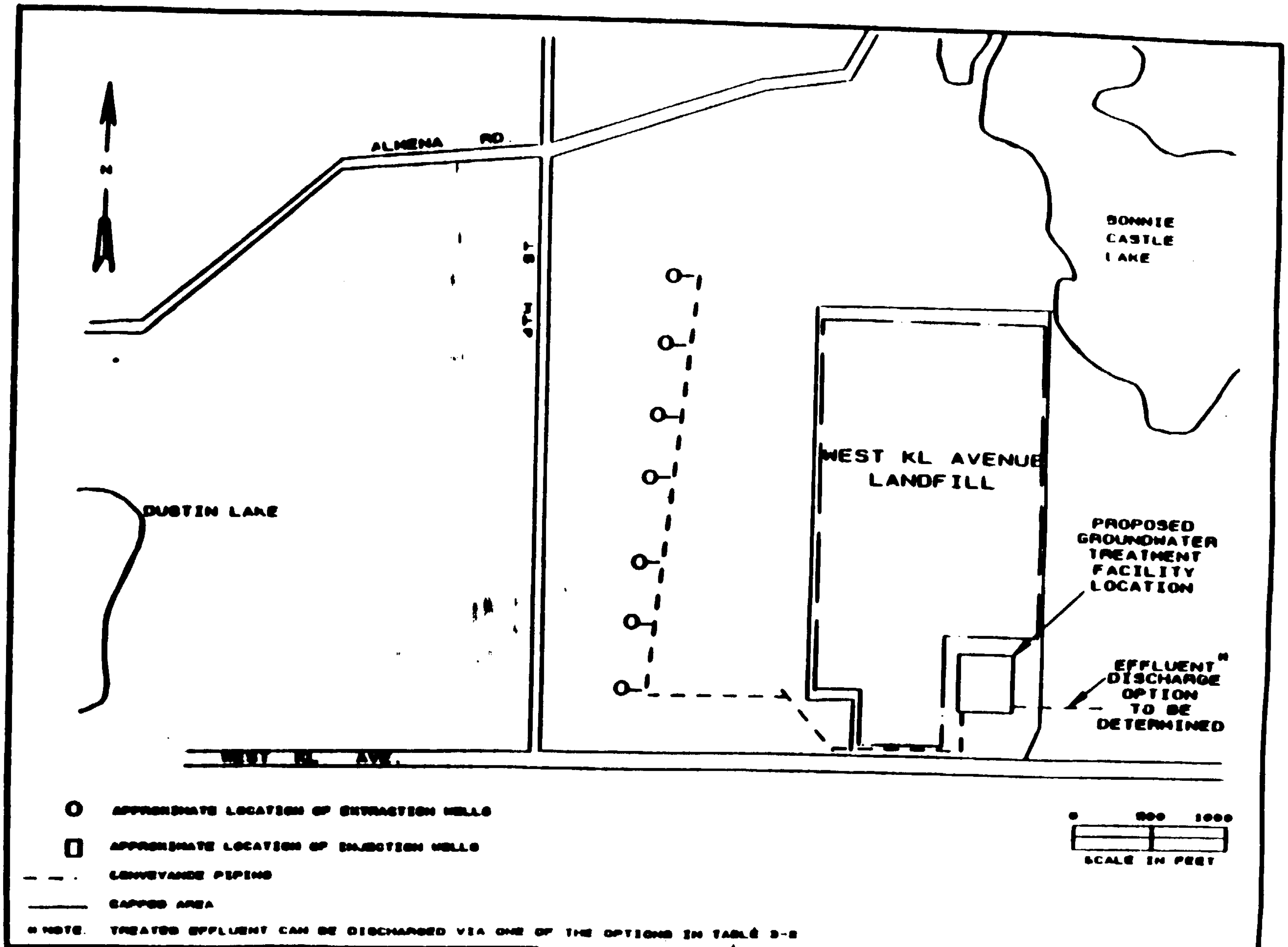

FIGURE 8

PRELIMINARY LAYOUT OF GROUNDWATER EXTRACTION, TREATMENT AND INJECTION SYSTEM around the perimeter of the landfill, regrading small areas, revegetating areas without cover grass, and by placing deed restrictions (prohibiting the construction of buildings or other structures) on the landfill property or property immediately adjacent to it. No remedial action would be taken at the landfill under this alternative. (If this alternative is combined with a containment alternative, the regrading and revegetating of the landfill will be according to the containment option.) ARARs regarding landfill closure will not be met by this alternative.

Estimated Construction Cost: $162,400
Estimated Total O&M Costs: $151,700
Estimated Total Present Worth: $314,100
Estimated Implementation Timeframe: 1 year, with 30 years of monitoring

Alternative LF #3: Containment (Capping)

This alternative involves the containment of the landfill contents. This is provided by the installation of a cap over the filled portions of the site to prevent the release of contaminants at the surface and by reducing the quantity of waste constituents that reach the groundwater by infiltration. RCRA, Subtitle C closure or its equivalent, is a relevant and appropriate closure for this Facility since it has been documented that the landfill accepted quantities of hazardous waste (drums, bulk and sludges) during its operation, but prior to November of 1980. Michigan Act 641, Solid Waste Management Act, has not been considered any further in the FS process since closure under that Act will not attain the ARARs required by Act 64. The area of the landfill that needs to be capped under this alternative is estimated to be approximately 83 acres (Figure 10). This alternative is further broken down into three capping designs. Gas venting (an estimated 1 gas vent per 5 acres) and monitoring are a part of each of the containment options.

Alternative LF #3a: Containment Utilizing a Clay Cap; Michigan Act 64

This alternative calls for containment utilizing a minimum 3-foot compacted clay layer, a 3-foot clean fill layer, and a 6-inch topsoil layer (Figure 11), as per Michigan Act 64. The clay must have a maximum laboratory permeability of 1×10^{-7} cm/sec. The 3-foot clean fill layer will be placed on top of the clay to serve primarily as a frost protection layer. The clean fill layer will also protect the clay layer from penetration by deep-rooted plants and burrowing animals and provides for lateral drainage of precipitation. The 6-inch layer of topsoil will provide a substrate for vegetative cover.

Gas vents (an estimated 1 per every 5 acres) will be needed to alleviate the horizontal migration of landfill gas. These vents will be monitored. Landfill closure ARARs will be satisfied by this alternative.

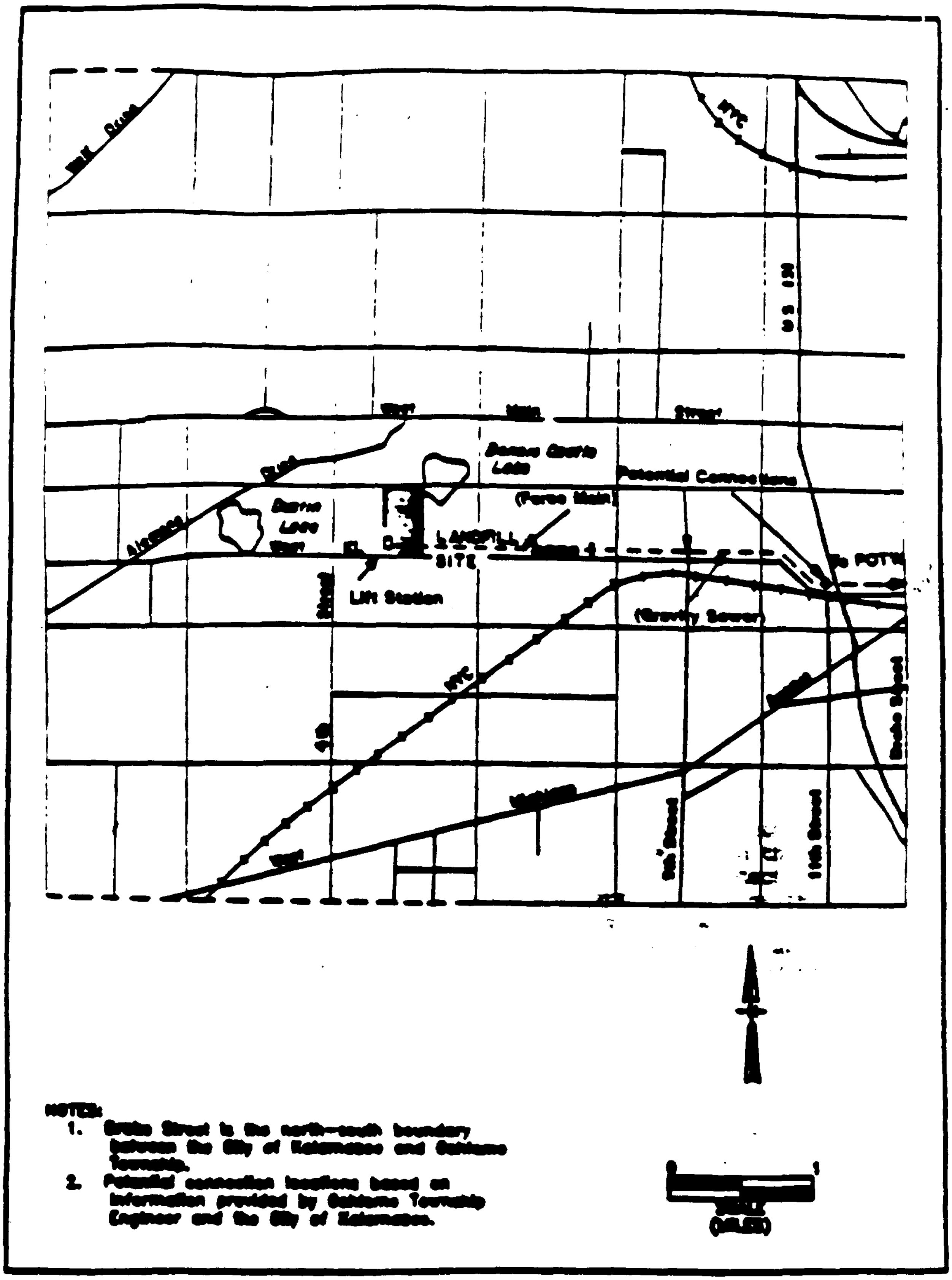

FIGURE 9

POTENTIAL LOCATIONS FOR
CONNECTION OF NEW SEWER TO EXISTING PUBLIC SEWER
OFF-SITE GROUNDWATER TREATMENT ALTERNATIVE 4A

Estimated Construction Cost: $11,251,900
Estimated Total O&M Costs: $150,800
Estimated Total Present Worth: $11,402,700
Estimated Implementation Timeframe: 2-5 years, with 30 years of monitoring

Alternative LF #3b: Containment Utilizing a RCRA-Type Cap

This alternative calls for containment utilizing a RCRA-type cap that is similar to LF #3a except that an additional impermeable layer is provided in the form of a synthetic liner, in place of 1-foot of clay, and an additional drainage layer is added in place of 1-foot of clean fill material (Figure 12). The RCRA-type cap consists of a 2-foot clay layer with a 60-mil high density polyethylene liner placed directly on top of it. A drainage layer is necessary immediately atop the synthetic liner to allow lateral drainage of precipitation. This layer consists of 12-inches of pea gravel with a layer of 6-ounce geotextile filter-fabric placed above it to protect it from clogging. A 2-foot layer of clean fill is placed above the drainage layer to protect the lower layers from frost damage. Lastly, a 6-inch topsoil layer is placed on top in order to provide a substrate for the growth of vegetative cover.

The horizontal migration of landfill gas will be addressed as in Alternative LF #3a. Landfill closure ARARs will be satisfied by this alternative, since Alternative #3b is equal to or greater in performance than Michigan Act 64, (Alternative #3a).

Estimated Construction Cost: $13,601,600
Estimated Total O&M Costs: $150,800
Estimated Total Present Worth: $13,752,400
Estimated Implementation Timeframe: 2-5 years, with 30 years of monitoring

Alternative LF #3c: Clay Cap with a Synthetic Liner

This alternative is a combination of Alternatives LF #3a and LF #3b. It calls for containment (3 feet of compacted clay) meeting the requirements of Michigan Act 64, as in Alternative LF #3a, and in addition, includes a synthetic liner, as in Alternative LF #3b. The synthetic liner will be placed directly on top of the clay layer.

The horizontal migration of landfill gas will be addressed as in Alternative LF #3a. Landfill closure ARARs will be satisfied.

Estimated Construction Cost: $14,139,100
Estimated O&M Costs: $150,800
Estimated Total Present Worth: $14,289,900
Estimated Implementation Timeframe: 2-5 years, with 30 years of monitoring

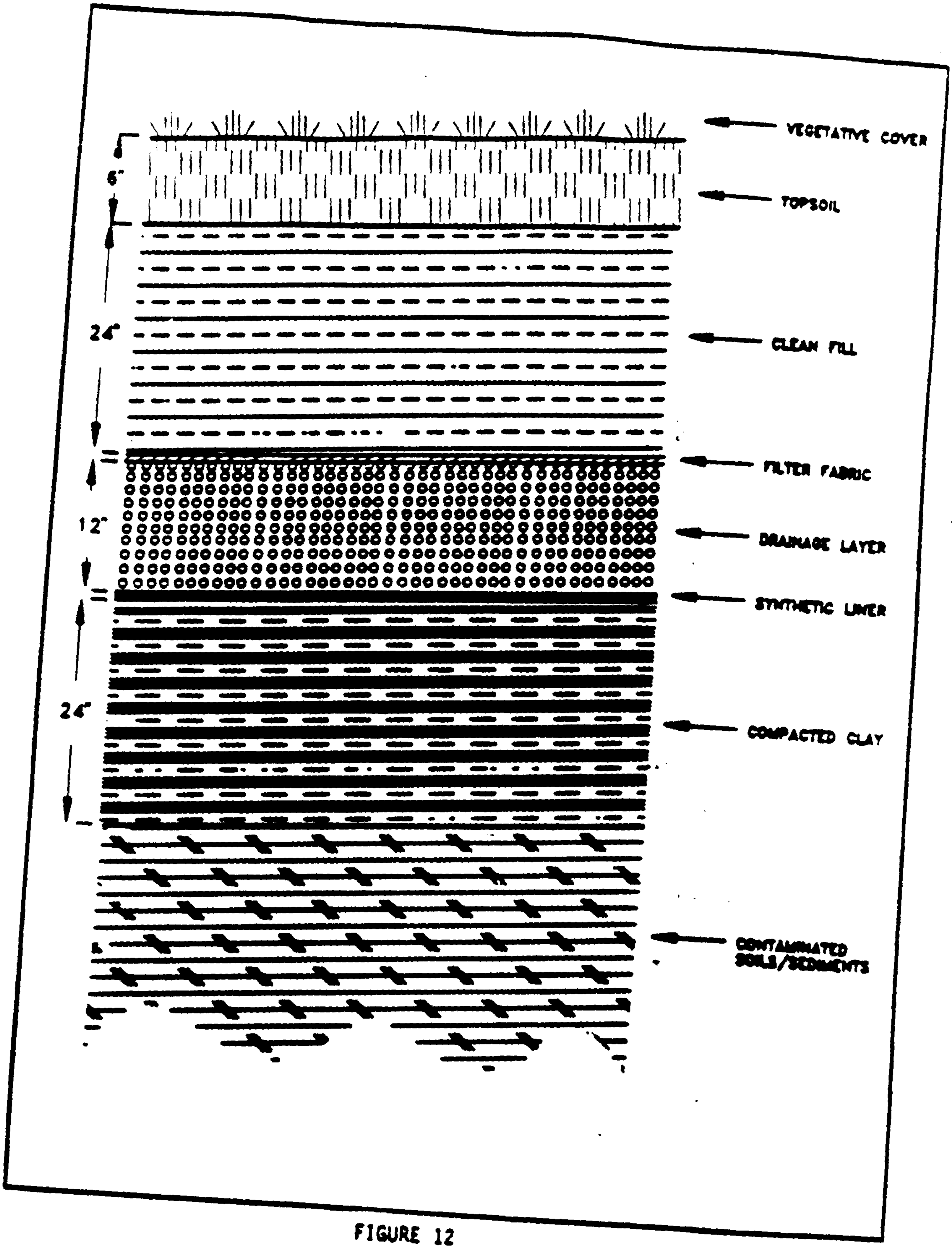

FIGURE 12

CROSS SECTION OF RCRA CAP FOR LANDFILL ALTERNATIVE 3B

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C. APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)

Table 6 identifies the applicable or relevant and appropriate requirements (ARARs) for each of the alternatives mentioned in A and B above. The major ARARs for the groundwater remedial actions are the Federal Safe Drinking Water Act, Michigan's Act 307 rules, promulgated July 12, 1990. The Federal Safe Drinking Water Act is relevant and appropriate to this aquifer because the aquifer is a potential source of drinking water, assuring that no groundwater suitable for drinking water supplies exceeds the Maximum Contaminant Levels or Maximum Contaminant Level Goals. The requirement to perform either a type A, B or C cleanup under the Michigan Environmental Response Act (Act 307) is an ARAR for the remedial action to be undertaken at this site. This Act provides, inter alia that remedial action be protective of human health, safety and the environment, (Rule 299.5705(1)). The rules, under Act 307, Parts 6 and 7, specify that this standard is achieved by a degree of cleanup which conforms to one or more of the three cleanup types (Rule 299.5705(2)): a type A cleanup generally achieves cleanup to background (Rule 299.5707); a type B cleanup meets specified risk-based levels in all media (Rule 299.5709); and a type C cleanup is based on a site-specific risk assessment which considers specified criteria. EPA has decided that the selected remedy will meet the standards for a type B cleanup for the groundwater cleanup levels since the levels of contaminants found in the groundwater are in exceedence of federal and state drinking water standards. The EPA has further decided that the containment of the landfill wastes meets the criteria for type C cleanup, since no "hot spots" of wastes were discovered during the test pit operations; so containment by capping is the most feasible approach to address the release of contaminant from the landfill. LDRs are applicable to the disposal of any sludges or residuals produced by on-site treatment. The State has identified Act 245 as an ARAR since the treated groundwater may be reinjected into the shallow aquifer. The EPA disagrees that Act 245, as interpreted and applied by the State in this matter, is an ARAR. Nonetheless, it is the State's judgment that the selected remedial action for this site will provide for attainment of all ARARs including the Michigan Water Resources Act and Part 22 Rules. The remedial action will halt the migration of contaminated groundwater and restore the aquifer to a usable condition. In addition, the purged water will be treated prior to reinjection and then hydraulically contained by the purge wells in a manner that will prevent degradation of groundwater quality, consistent with the Water Resources Commission Act and Part 22 Rules. For the landfill containment remedial actions, the major ARAR is Michigan's Act 64. Act 64 addresses the closure of landfills that have accepted hazardous wastes for disposal, such as this Facility and is relevant and appropriate to this cleanup since hazardous wastes were disposed of prior to November, 1980.

VIII. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The groundwater and landfill containment alternatives have been compared utilizing nine evaluation criteria. The criteria used for evaluating and comparing the alternatives are listed below. Please refer to the FS for further detail on the alternatives and the evaluation criteria.

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TABLE 6

DETAILED ANALYSIS OF ALTERNATIVES
COMPLIANCE WITH ARARS
WEST KL AVENUE LANDFILL

ARAR	Requirements	Groundwater Alternatives							Landfill Alternatives				
		1	2	3a	3b	3c	3d	4a	1	2	3a	3b	3c
Federal ARAR													
Contaminant-Specific													
40 CFR 141	MCLs for drinking water quality.	N	N	Y'	Y	Y	Y	Y	NA	NA	NA	NA	NA
Location-Specific													
None applicable													
Action-Specific													
Clean Air Act, Section 101	Regional air pollution program addressing emissions during remediation.	NA	NA	R	R	R	R	NA	NA	R	R	R	R
40 CFR 52	Regional air quality plan for remedial activities.	NA	NA	R	R	R	R	NA	NA	R	R	R	R
40 CFR 50	Air quality standards for remedial activities.	NA	NA	R	R	R	R	NA	NA	R	R	R	R
40 CFR 257	Standards for solid waste disposal facilities (delegated to states).	NA	NA	NA	NA	NA	NA	NA	N	N	Y	Y	Y
40 CFR 261	Identification of hazardous waste.	NA	NA	R	R	R	R	NA	NA	NA	NA	NA	NA
40 CFR 262	Regulations for hazardous waste generators.	NA	NA	R	R	R	R	NA	NA	NA	NA	NA	NA
40 CFR 263	Regulations for transport of hazardous waste.	NA	NA	R	R	R	R	NA	NA	NA	NA	NA	NA

TABLE 6 (CONT.)

DETAILED ANALYSIS OF ALTERNATIVES
COMPLIANCE WITH ARARS
WEST KL AVENUE LANDFILL

ARAR	Requirements	Groundwater Alternatives 1	2	3a	3b	3c	3d	4a	Landfill Alternatives 1	2	3a	3b	3c
40 CFR 264	Regulations for owners/operators of hazardous waste facilities.	NA	NA	R	R	R	R	NA	NA	NA	R	R	R
40 CFR 268	Land disposal restrictions for hazardous wastes.	NA	NA	R	R	R	R	NA	NA	NA	NA	NA	NA
40 CFR 265	Regulations for owners/operators of interim status hazardous waste facilities.	NA	NA	R	R	R	R	NA	NA	NA	R	R	R
Executive Order 12372; 40 CFR 29	Requires state and local coordination of CERCLA projects.	R	R	R	R	R	R	R	R	R	R	R	R
State ARAR													
Contaminant-Specific													
Act 307 Rules (Michigan Environmental Response Act) Effective 7/12/90	Requires remediation of ground-water to specific risk levels for carcinogens and background for non-carcinogens.	N	N	Y*	Y	Y	Y	Y*	NA	NA	NA	NA	NA
Location-Specific													
None applicable													
Action-specific													
Act 64 of 1979 (The Hazardous Waste Management Act)	Hazardous waste regulations for State of Michigan.	NA	NA	R	R	R	R	NA	N	N	Y	R	Y
Act 127 of 1970 (The Michigan Environmental Protection Act)	Prohibits any action which pollutes state's natural resources.	NA	R	R	R	R	R	R	NA	R	R	R	R
* Act 245 of 1929 (The Water Resources Commission Act) - Part 9	Reporting requirements for discharge to sanitary sewer system	NA	NA	NA	NA	NA	NA	*	NA	NA	NA	NA	NA

TABLE 6 (CONT.)

DETAILED ANALYSIS OF ALTERNATIVES
COMPLIANCE WITH ARARS
WEST KL AVENUE LANDFILL

ARAR	Requirements	Groundwater Alternatives 1	2	3a	3b	3c	3d	4a	Landfill Alternatives 1	2	3a	3b	3c
- Part 21	Effluent discharge permitting and monitoring requirements.	NA	NA	*	*	*	*	NA	NA	NA	NA	NA	NA
- Part 22	Prohibits the degradation of groundwater in usable aquifers as a result of a discharge.	NA	NA	*	*	*	*	NA	NA	NA	NA	NA	NA
Act 315 of 1969 (The Mineral Well Act)	Requirements for monitoring wells at site.	NA	R	R	R	R	R	R	NA	NA	NA	NA	NA
Act 345 of 1966 (The Air Pollution Act)	Requires permit for any equipment that produces air emissions.	NA	NA	R	R	R	R	NA	NA	NA	NA	NA	NA
Act 347 of 1972 (The Soil Erosion and Sedimentation Control Act)	Requires soil erosion and sedimentation control plan for remediation.	NA	NA	NA	NA	R	R	NA	NA	R	R	R	R
** Act 348 of 1965 (The Air Pollution Act)	Requires air emissions from devices or site work to be "non-injurious."	NA	NA	**	**	NA	NA	NA	NA	**	**	**	**
Act 368 of 1978 (Public Health Code)	Specifies procedures for water well abandonment.	NA	R	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Act 641 of 1978 (The Solid Waste Management Act)	Standards for operation (and closure) of a solid waste landfill.	NA	NA	NA	NA	NA	NA	NA	N	N	Y	Y	Y

Note:

NA - ARAR is not applicable to the alternative.
Y - Yes; compliance with ARAR would be achieved if alternative were implemented.
N - No; compliance with ARAR cannot be achieved if alternative were implemented.
R - Required; compliance with ARAR would be required if alternative were implemented.

aGroundwater alternative 3a can provide complete contaminant-specific ARARs compliance by utilizing a high level of treatment or can provide partial ARARs compliance by using a reduced level of treatment.

bWill not be possible to analytically determine compliance with chemical-specific ARARs.

* The State has identified Act 245 as an ARAR. The United States disagrees that Act 245, as interpreted and applied by the State in this matter, an ARAR. Nonetheless, it is the State's judgment that the selected remedial action for this site will provide for attainment of all ARARs includ the Michigan Water Resources Act and Part 22 Rules. The remedial action will halt the migration of contaminated groundwater and restore the aqui to a usable condition. In addition, the purged water will be treated prior to reinjection and then hydraulically contained by the purge wells in manner that will prevent degradation of groundwater quality, consistent with the Water Resources Commission Act and Part 22 Rules.

** Applies to promulgated State air e...ion regulations only.

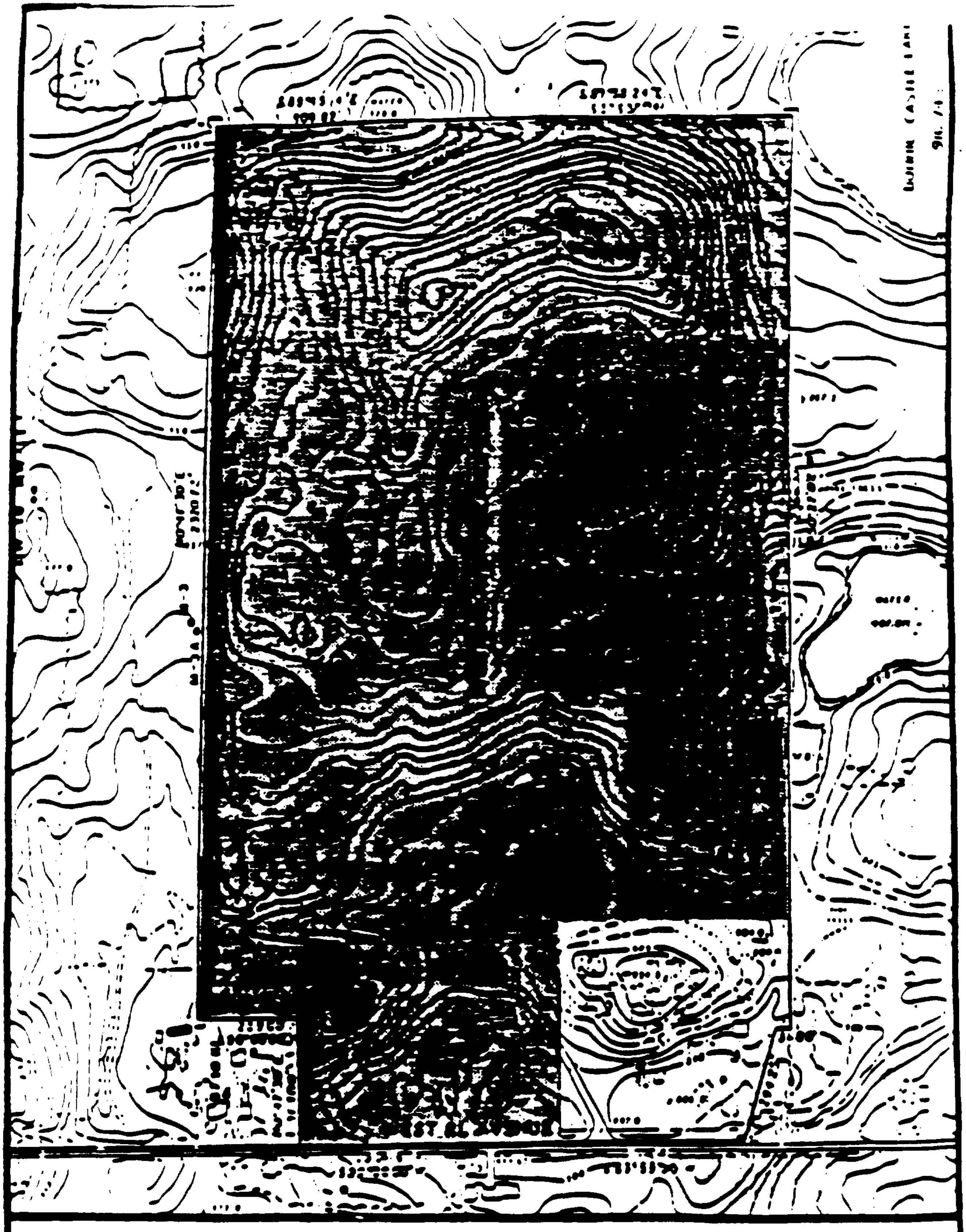

FIGURE 10

AREA TO BE CAPPED UNDER LANDFILL ALTERNATIVES 3a AND 3b AND 3c 1" = 350'

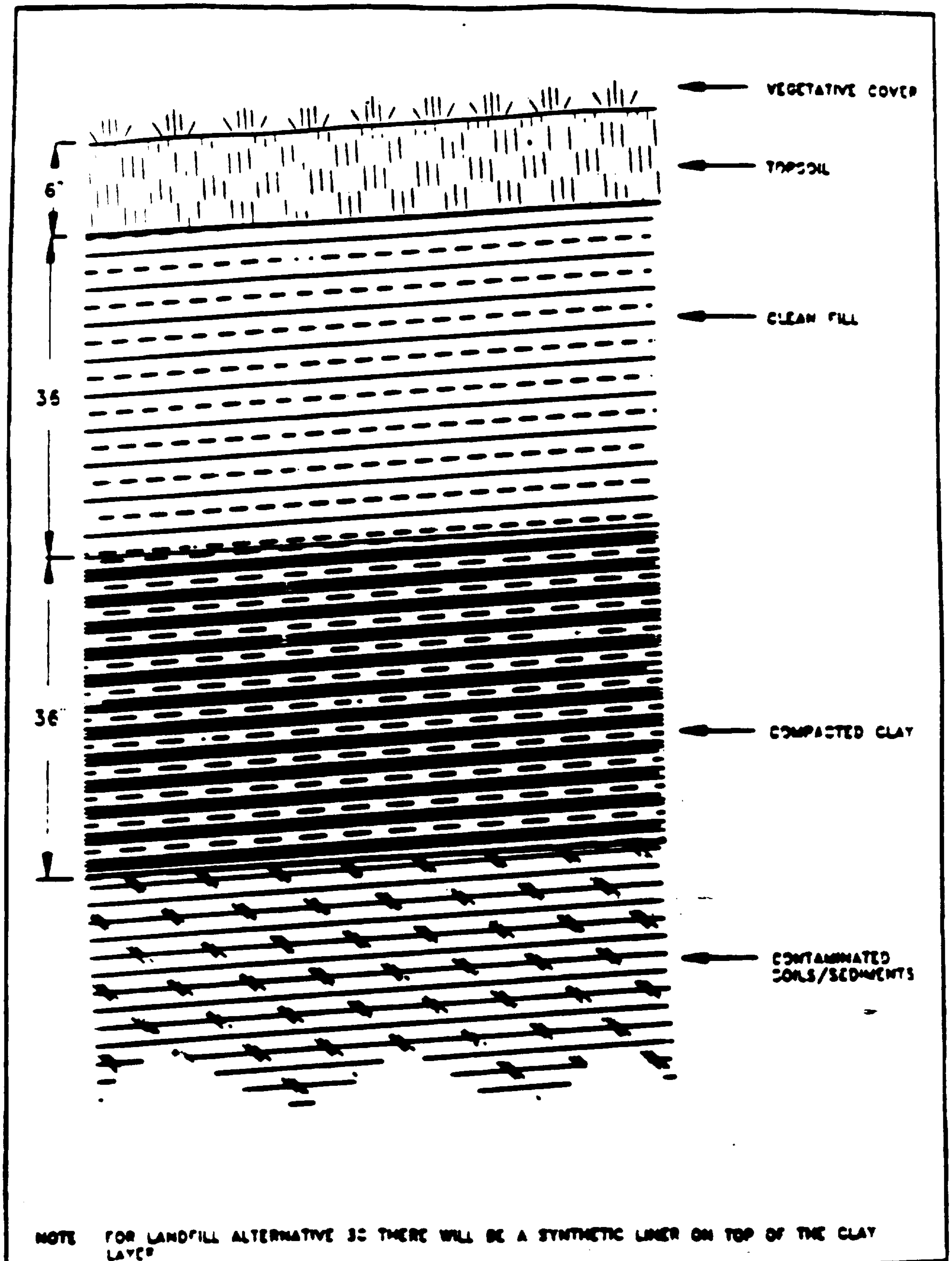

FIGURE 11

CROSS SECTION OF CLAY CAP FOR
LANDFILL ALTERNATIVE 3A

OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT addresses whether or not a remedy provides adequate protection and describes how risks are posed through each pathway are eliminated, reduced or controlled through treatment, engineering controls, or institutional controls.

COMPLIANCE WITH ARARS (APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS) addresses whether or not a remedy will meet all of the applicable or relevant and appropriate requirements of other Federal and State environmental statutes and/or provide grounds for invoking a waiver.

LONG-TERM EFFECTIVENESS AND PERMANENCE refers to the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been met.

SHORT-TERM EFFECTIVENESS addresses the period of time needed to achieve protection, and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

REDUCTION OF TOXICITY, MOBILITY, OR VOLUME is the anticipated performance of the treatment technologies a remedy may employ.

IMPLEMENTABILITY is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

COST includes estimated capital and operation and maintenance costs, and net present worth costs.

STATE ACCEPTANCE indicates whether, based on its review of the RI/FS and Proposed Plan, the State concurs in, opposes, or has no comment on the preferred alternative at the present time.

COMMUNITY ACCEPTANCE is based on comments received from the public during the public comment period. These comments are will be assessed in the Responsiveness Summary attached to the ROD following a review of the public comments received on the RI/FS report and the Proposed Plan.

A) THRESHOLD CRITERIA

The two most important criteria are statutory requirements that must be satisfied by any alternative in order for the alternative to be eligible for selection. These two criteria are as follows:

1) Overall Protection of Human Health and the Environment:

i) Groundwater (GW) Alternatives: GW #1 and #2 do not provide any treatment of the groundwater, and consequently do not protect human health and the environment from the potential or actual risks existing in the groundwater. The GW Alternatives that offer the most protectiveness to human health and the environment are those that include treatment as part of the remedy. Therefore, alternatives GW #3a-d and GW #4a are more protective than are alternatives GW #1 (No Action) and GW #2 (Limited Action), which offer no or little added protection. Among the treatment alternatives, the level of protectiveness is comparable, with the exception that GW sub-alternative 3a, which will leave higher concentrations of contaminants in the groundwater than would the other alternatives. Of the on-site treatment alternatives, all require that the sludges from the inorganic treatment process be disposed of off-site. Alternatives GW 3a-c require that spent carbon be regenerated or disposed of off-site. Alternative GW #3d requires no additional material to be disposed of off-site, since the organic contaminants are destroyed and not transferred to a different media. Alternative GW #4a would remove the contaminants from the Facility area and therefore be protective of human health and the environment in the immediate Facility area and by the POTW meeting its discharge permit requirements, this alternative would be protective of human health and the environment at the point of discharge. Under Alternative GW #4a, the extracted groundwater would be treated at the POTW and discharges of the treated water would then meet discharge standards prior to being discharged into the Kalamazoo River. All the treatment alternatives will be designed to reduce the level of risk presented in the groundwater from the present risk levels down to $1x10^{-6}$ cancer risk level and to a HI value of less than 1 for noncarcinogens. In summary, Alternatives GW #3a-d and GW #4a provide adequate protection to human health and the environment while Alternatives GW #1 and 2 do not provide adequate protection.

ii) Landfill (LF) Alternatives: The LF Alternatives provide varying degrees of protectiveness ranging from no protection (No Action Alternative LF #1), to marginal added protection (Limited Action Alternative LF #2), to maximum feasible protection (Capping Alternatives LF #3a-c). None of the Landfill Alternatives involve treatment as part of the alternative. The capping alternatives provide significantly greater protection to human health and the environment than LF #1 and #2, since they act on reducing or eliminating the mechanism for the contaminants to reach the groundwater, by reducing the generation of leachate within the landfill through containment. Alternatives LF #3b and 3c are more protective than Alternative LF #3a since they reduce leachate generation to a greater degree than does LF #3a. Alternatives LF 3b and 3c are comparable in protectiveness. In summary, Alternatives LF #3a-c provide adequate protection to human health and the environment while Alternatives LF #1 and 2 do not.

2) Compliance with Applicable or Relevant and Appropriate Requirements (ARARs):

i) GW Alternatives: Alternatives GW #1 (No Action) and GW #2 (Limited Action) do not achieve compliance with the contaminant-specific or action specific ARARs. Only the treatment alternatives, GW #3a-d and #4a, comply with ARARs, with the exception of sub-alternative GW #3a. See Table 6. The contaminant-specific ARARs are listed in Table 5 and are listed within the RI and FS Reports.

ii) LF Alternatives: Alternatives LF #1 (No Action) and LF #2 (Limited Action) do not achieve compliance with landfill closure ARARs.

West KL Avenue Landfill was a municipal solid waste landfill, making Michigan Act 641 an ARAR, but it also accepted hazardous wastes and substances, as documented in the Administrative Record, so Michigan Act 64 is also an ARAR, being relevant and appropriate. Alternatives LF #3a-c all meet the requirements of Act 641 but only Alternatives LF #3a and 3c comply with Act 64. Alternative #3b, even though it does not have the 3 foot layer of compacted clay as required by Act 64, it does have 2 foot of clay with a synthetic liner and therefore achieves similar or greater performance as does the Act 64 cap (LF #3a).

B) PRIMARY BALANCING CRITERIA

Five primary balancing criteria are used to identify major trade-offs between the remedial alternatives which satisfy the two threshold criteria. These trade-offs are ultimately balanced to identify the preferred alternative and to select the final remedy. The five criteria are as follows:

1) Long-term Effectiveness and Permanence:

i) GW Alternatives: The long-term effectiveness criterion primarily requires assessing the magnitude of residual risks remaining after an alternative has been implemented and the remedial action objectives have been met. Alternative GW #1 (No Action) does not reduce risk at the site and therefore provides no long-term effectiveness. Alternative GW #2 (Limited Action) provides little long-term effectiveness since it only reduces risk by preventing exposure and does not address the capture or treatment of the contamination. The treatment alternatives, GW #3a-d and GW #4a, all reduce the risk by removing contamination and consequently have the greatest level of long-term effectiveness. Proper operation and maintenance procedures will need to be observed in order to assure the continuing effectiveness of the treatment alternatives.

ii) LF Alternatives: Alternative LF #1 (No Action) does not provide any long-term effectiveness since it does not involve any remedial action. Alternative LF #2 (Limited Action) provides some degree of long-term effectiveness since it involves institutional controls such as deed restrictions, which will aid in reducing future risks at the site. The capping alternatives LF #3a-c, provide the greatest degree of long-term effectiveness provided that the cap is installed properly and the integrity of the landfill cap is maintained through regular repairs. Of the landfill caps, LF #3b and c provide significantly greater long-term effectiveness over the more permeable cap in LF #3a, because they allow considerable less percolation and infiltration through the landfill. None of the Landfill Alternatives offer treatment or removal of the wastes within the landfill, since these actions were screened out within the FS due to the infeasibility of implementing the alternative and/or due to the grossly excessive and disproportionate cost of the alternative.

2) Short-term Effectiveness:

i) GW Alternatives: Short-term effectiveness considers the affects that result during the implementation of the alternatives. GW #1 (No Action) and GW #2 (Limited Action) involve no or minimal remedial action so that short-term effectiveness is not an applicable consideration except for the fact that they can be rapidly implemented with little or no disturbance to the surrounding environment. The other groundwater alternatives require an implementation timeframe of several years, but involve only indirect exposure to contaminants by workers and no exposure to the groundwater or treatment residuals by the public. The local residents may be inconvenienced during the installation of the extraction wells and injection wells (if the POTW is not used), but this short-term inconvenience will occur with all the GW treatment alternatives. GW #4a will also inconvenience a number of local residents, on a short-term basis, since this alternative requires the installation of nearly 3 miles of new sewer line running down West KL Avenue. This inconvenience will be due solely to the construction of the sewer line and will not expose the residents to any contamination.

ii) LF Alternatives: Alternatives LF #1 (No Action) and LF #2 (Limited Action) involve no or minimal remedial action so that short-term effectiveness is not an applicable consideration except for the fact that they can be rapidly implemented with little or no disturbance to the surrounding environment. With the capping alternatives, LF #3a-c, short-term effectiveness will be ensured by the implementation of controlled construction procedures and by strict adherence to appropriate health and safety plan measures during construction. These factors will provide environmental and worker protection during construction. Community protection from indirect adverse effects such as noise and truck traffic during cap construction will be difficult to achieve under either of the capping alternatives. LF #3a may have less short-term effects on the local population than LF #3b and c, since less material would need to be brought to the site for the construction of the cap.

3) Reduction of Toxicity, Mobility, or Volume Through Treatment:

i) GW Alternatives: According to the guidelines within the National Contingency Plan (NCP), the groundwater at and near the Facility may be classified as a Class II-A aquifer, groundwater that is currently being used as a drinking water source. Therefore treatment is preferred. The reduction of toxicity, mobility or volume through treatment is satisfied only by the groundwater treatment alternatives, GW #3a-d and GW #4a. Since groundwater is not treated under GW #1 (No Action) and GW #2 (Limited Action), no reduction in toxicity, mobility, or volume is achieved through treatment. The degree to which each treatment alternative provides reduction in toxicity, mobility, and volume varies little with the treatment technologies utilized to achieve compliance with ARARs. All of the groundwater treatment alternatives meet the SARA treatment preference and provide nearly the same level of reduction in toxicity and mobility, although dilution is the primary toxicity reduction mechanism in GW #4a. Alternative GW #3d is the only treatment alternative that reduces contaminant volume since it destroys organics by use of UV light. None of the other groundwater treatment alternatives involve volume reduction since the treatment is utilized only to achieve a reduction in the toxicity and mobility of the contaminants and the treatment systems simply transfer the contaminants from one media to another for later disposal or destruction. Systems utilizing carbon adsorption may eventually reduce contaminant volume, depending on the method of regeneration of the carbon material used in the system. The treatment alternatives may result in the generation of metal hydroxide sludges which will require proper disposal. Alternatives GW #3a-c utilize activated carbon adsorption and would periodically require the disposal of the exhausted or "spent" activated carbon. The use of the UV-enhanced oxidation (GW #3d) for organics removal does not generate residuals as in Alternatives GW #3a-c. As mentioned above, alternative GW #4a achieves treatment primarily via dilution enroute to the POTW, but the POTW utilizes tertiary treatment, so the extracted groundwater will receive treatment prior to discharge by the POTW. Pretreatment of the extracted groundwater may be deemed necessary prior to discharge into the POTW system.

ii) LF Alternatives: This criterion is not applicable because none of the three landfill alternatives provide treatment. The FS concluded that due to the large volume of waste present at the landfill, alternatives involving treatment which provides toxicity and volume reduction are not feasible, and/or have a cost which is grossly excessive and disproportionate to the overall effectiveness of the treatment alternative. The RI was unable to locate any concentrated areas of buried drums, so no removal or treatment options for the landfill contents were carried forward through the FS. It should be noted, however, that capping the landfill will reduce the mobility of the contaminants through containment measures and not treatment. The caps considered in LF #3b and #3c will allow less infiltration and will therefore provide better mobility reduction than the clay cap considered in LF #3a.

4) Implementability:

i) GW Alternatives: The No Action and the Limited Action Alternatives are the easiest alternatives to implement but as mentioned above, they do not attain ARARs or add any significant protection to human health and the environment. Of the groundwater remedial action alternatives, GW #4a, is easier to implement than any of the other remedial action alternatives. GW #4a will not require the construction of on-site treatment facilities as would the other groundwater treatment alternatives, unless pretreatment is required to meet the POTW's pretreatment standards. Each of the groundwater remedial action alternatives, except GW #4a, may require proper off-site disposal of precipitated inorganic sludges. Also, spent activated carbon will need to be regenerated or disposed of off-site for alternatives GW 3a-c.

The implementation of the GW #4a, over the other groundwater remedial action alternatives will be dependent on several factors including the following:

a) The quantity and quality of the CERCLA wastewater and its compatibility with the POTW.

b) The ability of the POTW to ensure compliance with applicable pretreatment standards and requirements, including monitoring and reporting requirements.

c) The POTW's record of compliance with its NPDES permit and pretreatment program requirements to determine if the POTW is a suitable disposal site for the CERCLA wastes.

d) The potential for volatilization of the wastewater at the CERCLA site and POTW and its impact upon air quality.

e) The potential for groundwater contamination from transport of CERCLA wastewater or impoundment at the POTW, and the need for groundwater monitoring.

f) The potential effect of the CERCLA wastewaters upon the POTW's discharge as evaluated by maintenance of water quality standards in the POTW's receiving waters, including the narrative standard of "no toxics in toxic amounts".

g) The POTW's knowledge of and compliance with any applicable RCRA requirement or requirements of other environmental statutes.

h) The various costs of managing CERCLA wastewater, including all risks, liabilities, permit fees, etc.

i) The approval from the owner of the POTW (City of Kalamazoo) and from the local governing body controlling the use of the sewer (Oshtemo Township and/or the County of Kalamazoo).

Alternative GW #3d is an innovative technology and is not as proven as the other technologies, especially on such a large scale as will be needed here. The major implementation problems to be encountered during the implementation of a groundwater remedy are similar among all the GW alternatives. Due to an expected high groundwater extraction rate needed to create a large capture zone, the groundwater treatment and reinjection system must operate at a very high flow rate, which may cause some implementation problems. The use of the local POTW has implementation problems including the factors stated above and the installation of sewer lines. Another implementability problem that may arise, and would be similar for all the GW remedial action alternatives, is the possible need to place extraction and/or injection wells or the treatment facility on private property and the need to purchase or lease this property may cause some implementation concerns. The limited action alternative (GW #2) is easily implemented, especially since the landfill is owned by the local municipality.

ii) LF Alternatives: The No Action and Limited Action alternatives are easily implemented, but as mentioned above, they do not attain ARARs or add any significant protection to human health and the environment. However, the limited action portion of the preferred alternative (LF #2) is easily implemented, especially since the landfill is owned by the local municipality. For the LF remedial action alternatives, all the alternatives are proven to be implementable. LF #3b is slightly more difficult to install than the cap called for under LF #3a and is similar in installation difficulty as is Alternative LF #3c. The clay cap-synthetic liner-drainage layer (LF #3b) will be more difficult to install than would a straight forward clay cap (LF #3a), especially considering the approximate 83 acre size needing to be covered. LF #3b requires 2 feet of clay, a synthetic liner and a drainage layer, while LF #3c requires 3 feet of clay and a synthetic liner, and provides similar contaminant performance as LF #3b.

5) Cost:

i) GW Alternatives: There are no costs associated with GW #1 (No Action) and only nominal costs associated with GW #2 (Limited Action). All of the groundwater treatment alternatives require significant expenditures. The least expensive treatment alternative is Sub-alternative GW #3a, which does not comply with all ARARs. The remaining treatment alternatives do meet ARARs and cost more than Sub-alternative GW #3a. Of these, GW #4a is the least costly with respect to both total present worth and total capital (O&M)/replacement costs regardless of whether pretreatment is required prior to discharge to the POTW. Annualized O&M/replacement costs for GW #3a and #3c are much higher than GW #3b and #3d because of the use of activated carbon. Costs are comparable for GW #3b and #3d. All costs presented in Table 7 may increase or decrease depending on several variables, including lower total pumpage rates, the need to purchase property, longer or shorter running time for the treatment process, etc., but these cost increases/decreases should be similar for all the groundwater treatment scenarios.

ii) LF Alternatives: There are no costs associated with the LF #1 (No Action) and only nominal costs are associated with LF #2 (Limited Action). Of the three capping alternatives, the total present worth of Alternatives LF #3b and #3c (which involve installation of a synthetic liner) are 20 and 25 percent higher than the LF #3a (Clay cap), respectively. All capping alternatives have identical operations and maintenance costs.

C) MODIFYING CRITERIA

These two criteria reflect the comments and concerns of the State and the local communities on the alternatives presented to address the West KL Avenue Landfill contamination. These two criteria are as follows:

1) State/Support Agency Acceptance:

The MDNR has been the support agency for the RI/FS and has reviewed this Record of Decision. A Letter of Concurrence is attached to this ROD as Attachment 1. The MDNR concurs with the selection of groundwater and treatment as part of the remedy for the site, along with the selected remedy for the landfill. The MDNR, however, does not believe the use of enhanced bioremediation as the groundwater treatment will meet the cleanup

TABLE 7

COMPARATIVE SUMMARY OF ALTERNATIVE COSTS
WEST KL AVENUE LANDFILL

Alternatives	Total Capital Cost ($)	Total O&M, Replacement, and Monitoring Present Worth ($)	Total Present Worth ($)
Groundwater			
1. No Action	0	0	0
2. Limited Action	4,200	141,400	145,600
3a. Precipitation, Air Stripping, and Carbon Adsorption	6,406,400	17,783,800	24,190,200
3a. Sub-Alternative: Precipitation, Air Stripping, and Carbon Adsorption	5,829,700	5,153,500	10,982,500
3b. Precipitation, Steam Stripping, and Carbon Adsorption	7,011,500	6,715,300	13,726,800
3c. Precipitation and Carbon Adsorption	5,687,900	17,215,100	22,903,800
3d. Precipitation and UV-Enhanced Oxidation	5,943,200	6,870,400	12,813,600
4a. Treatment at Kalamazoo POTW[1]	2,592,300 11	6,735,400	9,327,700
Landfill			
1. No Action	0	0	0
2. Limited Action	162,400	151,700	314,100
3a. Clay Cap	11,251,900	150,800	11,402,700
3b. RCRA-Type Cap	13,601,600	150,800	13,752,400
3c. Clay Cap with Synthetic Liner	14,139,100	150,800	14,289,900

Note:

(1) Based on the assumption that no pretreatment is needed for discharge to the POTW.

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goals as stated within this ROD. To compensate for the MDNR's concern, the ROD has been written to have the groundwater treatment portion of the remedy either replaced or supplemented if it is shown during the remedial design phase that enhanced bioremediation will not attain the cleanup goals consistent with an Act 307 Type B cleanup.

2) Community Acceptance:

Relatively few comment letters were received during the public comment period. Some were received from residents living nearby the landfill, others were from the Potentially Responsible Parties (PRPs), including the County of Kalamazoo and Oshtemo Township. In general, comments were negative towards the capping remedy, stating that the disruption caused by the construction of the cap is not compensated by the added protection it will provide. Also, comments requested that the groundwater treatment alternatives be re-evaluated since the UV-enhanced oxidation is both innovative and expensive and the pumping rate of 2000 gallons is too excessive. All the comments and concerns from the public and PRPs (from comment letters received during the public comment period or received verbally at the public hearing held on July 23, 1990) regarding the West KL Avenue Landfill and the Proposed Plan, are addressed within the Responsiveness Summary which is Attachment 2 to this ROD. Also, changes to the U.S. EPA's Proposed Plan, due to comments received during the public comment period are detailed in Section XI, Documentation of Significant Changes of this ROD.

IX. THE SELECTED REMEDY

Based on the findings of the RI/FS, the documents within the Administrative Record and the results of the public comment period, the selected remedy for the West KL Avenue Landfill is as follows:

Groundwater Remedial Action GW #3: Groundwater extraction and treatment utilizing enhanced bioremediation/fixed-film bioreactors (based on comments received during the public comment period), Groundwater Limited Action Alternative GW #2, Landfill Limited Action Alternative LF #2 and Landfill Capping Alternative LF #3b. The specifics of the selected remedial action for the West KL Avenue Landfill are as follows:

GW #2, Limited action including the following:

- Continued groundwater monitoring of the shallow and deep aquifers, including the installation of additional groundwater monitoring wells. Surface water and air (ambient and from the gas vents) will also need to continue to be monitored. Water level readings will continue to be taken in the groundwater monitoring wells.

- Deed restrictions, or similar assurances, restricting the use of the shallow aquifer as a drinking water source, at least until the clean-up standards are achieved. The area to be covered by use restrictions includes the residences along

West KL Avenue (north and south sides) from the landfill, west to 4th St., and the residences along 4th St. (east and west sides) from West KL Ave. to Almena Ave. (See Figure 2)

* Residential well closures (proper abandonment of the residential wells that were replaced in the early 1980's); and

GW #3, Groundwater pump and treat utilizing treatment technologies that will obtain the following groundwater remediation goals:

* extraction wells to capture all contaminated groundwater emanating from the site (wells must be placed so that the cones of depression overlap to assure the capture or containment of the groundwater to the west, southwest and northwest of the landfill).

* To restore groundwater to the levels indicated in Table 5 in the quickest time period practicable. Specifically, groundwater will need to be pumped until state and federal ARARs are obtained, which ever is more stringent. ARARs must be obtained at the landfill waste boundary and within all points beyond the boundary. In addition, the groundwater will be pumped and treated until contaminants do not exceed an individual excess cancer risk of $1x10^{-6}$ based on Michigan Act 307-Type B cleanup and a hazard index value greater than 1 (or comparable MI Act 307 human life cycle safe concentration (HLSC)). If MCLs or non-zero MCLGs are more stringent than the MI Act 307 values, then they are the cleanup levels. If background or best available detection limit values are higher than the cleanup levels, they will be substituted for the cleanup levels. Collectively, the cleanup levels will attain the $1x10^{-4}$ to $1x10^{-6}$ risk level as required by the NCP.

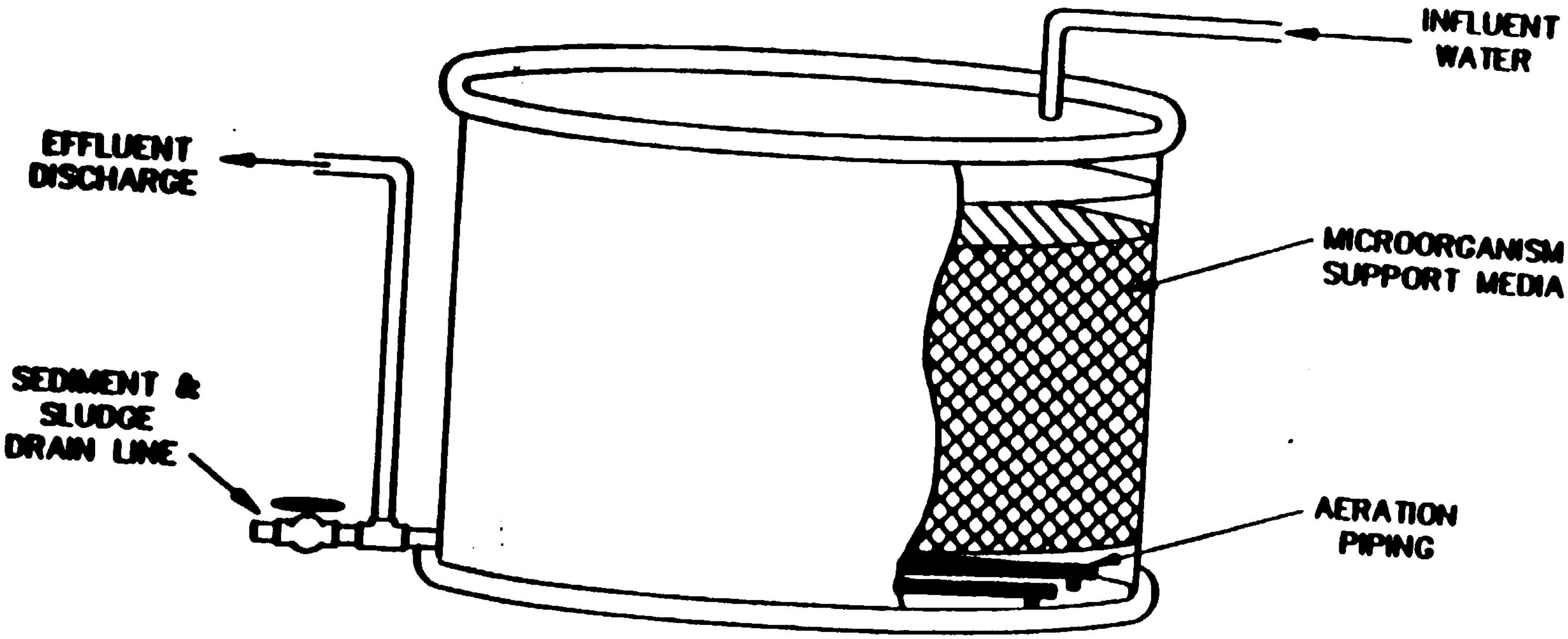
* Any direct discharges to the groundwater must comply with the requirements of MI Act 307 (as stated on Page 15, Section VII.C. of this ROD). If the groundwater requires treatment for inorganic compounds, as determined by EPA in consultation with the MDNR, prior to discharge to comply with ARARs, then treatment involving precipitation, as described within this ROD and in the FS, will be implemented. Any sludges or residuals will need to comply with LDRs.

* Any discharge to surface water bodies must comply with the Clean Water Act, NPDES permit requirements.

* Any discharge to the POTW must comply with the pretreatment levels as set by the operators of the POTW.

With these goals in mind, the selected treatment technology is the use of Enhanced Bioremediation via the use of Fixed-Film Bioreactors as presented in the comment submitted by the West KL Avenue Landfill

SUBMERGED FIXED-FILM BIOREACTOR



SCALE: NO SCALE			
GERAGHTY & MILLER, INC.	SG		

ALTERNATIVES ANALYSIS

WEST KL AVENUE LANDFILL
KALAMAZOO, MICHIGAN

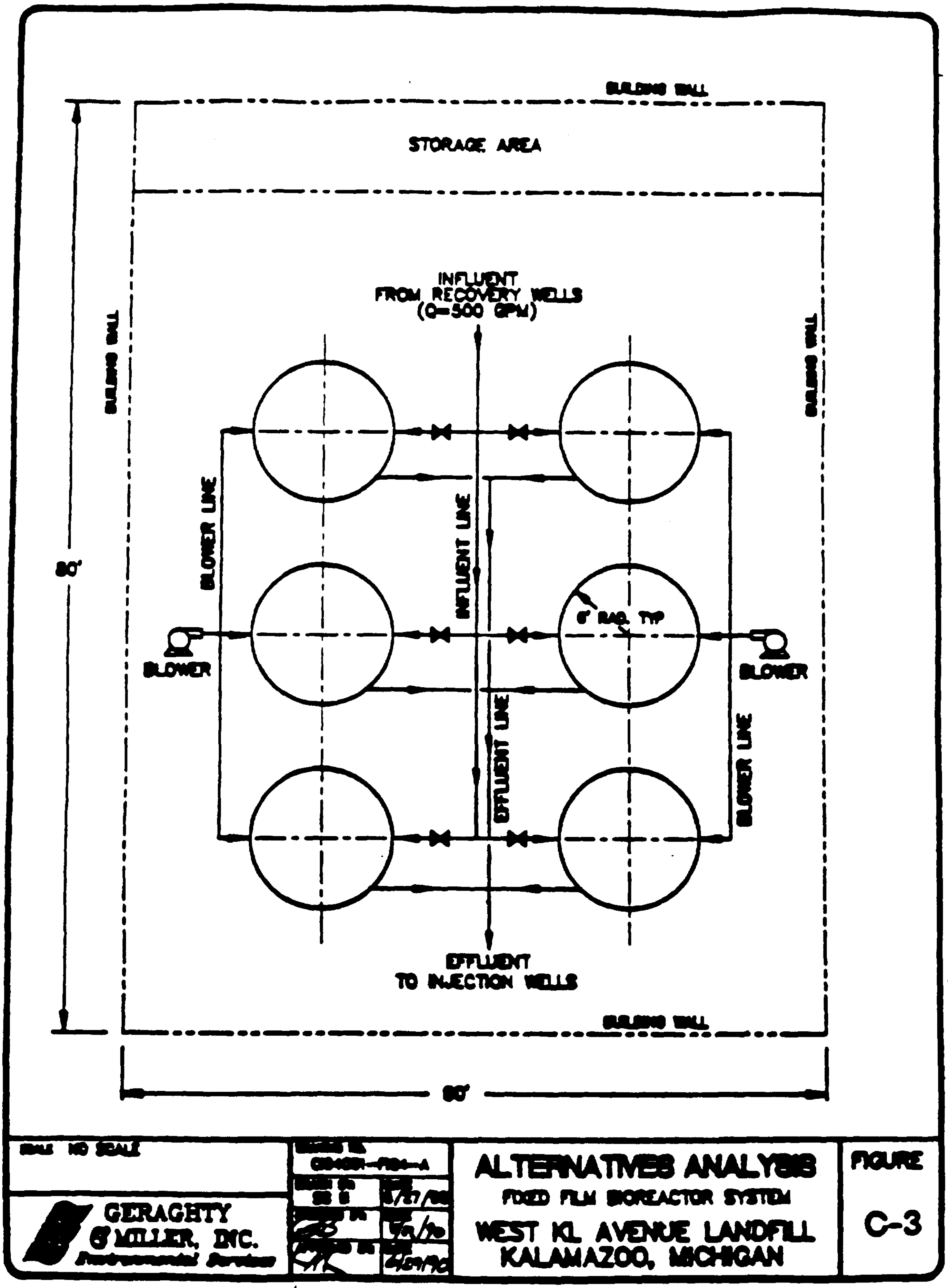
FIGURE C-2

FIGURE 13

Steering Committee, a group of approximately 24 PRPs, including the County of Kalamazoo, and prepared by their consultant, Geraghty and Miller, Inc (G&M). A description of the selected technology, Enhanced Bioremediation via the use of a Fixed Film Bioreactor, (and detailed in the document written by G&M and submitted to the U.S. EPA by the PRP Steering Committee entitled, "Review of U.S. EPA Proposed Alternative and Proposal of Additional NCP Compliant Remedial Alternatives for Implementation at the West KL Avenue Landfill", August 9, 1990), for the groundwater remediation portion of the U.S. EPA's ROD is as follows:

> Enhanced Bioremediation via the use fixed film bioreactors provides a viable method to remediate the groundwater in above-ground reactors at the site. According to the report by G&M, the above-ground biological reactors designed for low level concentrations of organic constituents are applicable for treatment of the present groundwater conditions at the West KL Avenue Landfill. The recommended bioreactor for this application is a submerged fixed-film bioreactor. This technology utilizes the slow decay, rather than growth, of organisms present on a biofilm. A healthy biofilm is initially grown within the bioreactor using a supplemental feed of organic carbon. When the biofilm has sufficiently matured, the organic feed is discontinued, and the waste stream to be treated (containing low influent organic concentrations) is fed into the reactor. Submerged fixed-film bioreactors use aerobic biofilm processes and must be supplied with an air distribution system. The average levels of iron and manganese would not require a pretreatment unit in order for the bioreactor to achieve necessary removal of organic compounds.
>
> Figure 13 presents a schematic of a typical submerged fixed-film bioreactor. The dimensions for each submerged fixed-film bioreactor is approximately 10 feet in height and 12 feet in diameter and is cylindrical in shape. Aeration can be provided by blowers and distributed through an air distribution system located in the bottom of the bioreactors. The solid support media that will maintain the bacterial film should be honeycomb shaped and be approximately 7 feet in height. The media must remain submerged in the water because contaminants in the groundwater are the source of food for the biomass on the support media. The recommended hydraulic retention time is one hour. The bioreactor is designed for a flow rate of 80 gpm; however, the groundwater will be pumped at an approximated rate of 500 gpm (actual pumpage rate will be determined during the design phase), therefore, at least seven bioreactors may be required. These reactors should be installed in parallel, (see Figure 14).
>
> The bioreactors may produce residuals such as sludges from settling activities and dead biomass. Also, if precipitation of the inorganics is deemed necessary after a pilot test is run, either to have the enhanced bioreactors work more efficient or to

FIGURE 14


BUILDING WALL
STORAGE AREA
INFLUENT
FROM RECOVERY WELLS
(Q=500 GPM)
BUILDING WALL
BUILDING WALL
BLOWER LINE
INFLUENT LINE
6' RAD. TYP
BLOWER
BLOWER
EFFLUENT LINE
BLOWER LINE
EFFLUENT
TO INJECTION WELLS
BUILDING WALL
80'
80'
SCALE NO SCALE
GERAGHTY
& MILLER, INC.
Environmental Services
ALTERNATIVES ANALYSIS
FIXED FILM BIOREACTOR SYSTEM
WEST KL AVENUE LANDFILL
KALAMAZOO, MICHIGAN
FIGURE
C-3

meet ARARs regarding the concentrations of inorganics allowed to be discharged, metal hydroxide sludges will be produced. Any waste produced during the treatment of the groundwater will be analyzed using RCRA's toxicity characteristic leaching procedure and disposed of properly, according to the LDRs.

Additional considerations for implementing biotreatment include nutrient application, pH monitoring, and temperature control. It is likely that nutrients such as nitrogen and phosphorus may need to be applied to the bioreactors to maintain a healthy bacteria population. The pH should be monitored and kept between a range of 6.0 and 9.0 in order to prevent a toxic environment for the bacteria. Temperatures should be maintained above 50°F for optimal biological activity. Atmospheric temperature fluctuations will be limited by enclosing the bioreactors within a heated building.

At least 5 recovery wells should be pumped at a flow rate of approximately 100 gpm/well (actual number of wells and gpm/well will not be determined until the design stage). The treated groundwater may then be injected back into the shallow aquifer through at least 3 reinjection wells (the actual number of reinjection wells will be determined during the design phase). An infiltration pond is a viable alternative to reinjecting the treated groundwater, but the viability of an infiltration pond can not be fully determined until a pump rate is established in the design stage.

According to the G&M Report, approximate costs of the enhanced bioremediation/fixed-film bioreactor are as follows for an operation period of 18 years:

Estimated Construction Cost: $1,351,600
Estimated Total Annual O&M Costs: $80.000
Estimated Total Present Worth: $2,195,000
Estimated Implementation Timeframe: 18 years

(Costs were estimated by G&M and may change depending on the actual number of extraction and reinjection wells that will be required, based on the design and the actual pumpage rate that will be required.)

If after a certain time period, to be decided by the U.S. EPA, in consultation with the MDNR, the enhanced bioremediation/fixed-film bioreactor remedy is not progressing toward achieving the cleanup goals, as stated in Table 5, an alternative shall be selected by EPA, in consultation with the MDNR, which shall be implemented to replace or supplement the bioremediation alternative. The alternatives which EPA may select shall consist of those which have been determined to satisfy the criteria discussed in this ROD. The comparative costs may differ at such time due to the remedial actions already conducted. The use of the POTW will have preference over the others, but UV-enhanced oxidation, air stripping, steam stripping and the others, may be considered if, after pilot tests, they can be shown to achieve the above stated groundwater remediation goals.

LF #2, Limited Action, including the following:

* Construction of a six-foot chain link fence around the perimeter of the Landfill. Including "No trespassing" signs and warning signs posted around the perimeter of the fence.

* The placement of deed/use restrictions, prohibiting the construction of buildings or other structures on the landfill property and property immediately adjacent to it, without prior consent from EPA, in consultation with the MDNR; and

LF #3b, Containment utilizing a RCRA-Type Cap including the following:

* Installation and maintaining a cap consisting of, from the bottom up, a 2-foot clay layer meeting the installation and compaction provisions of Michigan Act 64, a 60-mil high density polyethylene liner, a 12 inch drainage layer consisting of pea gravel, a 6-ounce geotextile filter fabric to protect the drainage layer from clogging, a 2-foot layer of clean fill for frost protection and on top, a 6-inch topsoil layer to provide a growth zone.

* The cap will cover the entire landfill, estimated to be approximately 83 acres in size. (Some estimates show the size of the landfill to be capped ranging between 60 and 83 acres. The actual area to be capped will need to be determined during the design of the cap.)

* The installation of gas vents throughout the landfill sufficient enough to alleviate the horizontal migration of landfill gas. Approximately 1 vent per 5 acres capped, at a minimum, will be necessary. Landfill gas will be monitored on a routine basis. If at any time the gas vent monitoring indicates contaminants being released into the air and presenting a health hazard outside the landfill boundaries (cumulative excess cancer risk outside the $1x10^{-4}$ to $1x10^{-6}$ range or cumulative HI value greater than 1) appropriate measures, as determined by EPA, in consultation with the MDNR, will be taken to correct the problem. Also, if at any time the landfill gas on-site or migrating horizontally off-site presents an explosive hazard, as determined by EPA, in consultation with the MDNR, appropriate action will be taken.

* Continued operation and maintenance of the landfill cap.

X. STATUTORY DETERMINATIONS

The selected alternatives for the West KL Avenue Landfill, as listed in Section IX of this ROD, meet the statutory requirements as set forth in Section 121 of CERCLA, in that they are protective of human health and the environment, attain ARARs, be cost effective, utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable and have a preference for treatment as a principal element as described below:

A) Protection of Human Health and the Environment

The selected remedy will be protective of human health and the environment through the use of land and groundwater use restrictions, containment of wastes and subsurface soils, and by the extraction and the treatment of contaminated groundwater.

Protection of human health and the environment will be achieved by the selected remedy by the installation of the groundwater extraction wells which will intercept and collect the contamination within the groundwater around the Facility and treat the groundwater on-site with enhanced bioremediation/fixed-film bioreactors. The selected groundwater remedy will remove the contaminants from the groundwater and discharge the treated groundwater back into the shallow aquifer, into an infiltration pond or to the POTW. Groundwater extraction will occur at the Facility until the contaminants achieve the goals as referenced by Michigan Act 307, Type B cleanup (Table 5). Specifically, the groundwater will be pumped and treated until contaminants do not exceed an individual excess cancer risk of $1x10^{-6}$ based on Michigan Act 307-Type B cleanup and a hazard index value greater than 1 (or comparable MI Act 307 human life cycle safe concentration (HLSC)). If MCLs or non-zero MCLGs are more stringent than the MI Act 307 values, then they are the cleanup levels. If background or best available detection limit values are higher than the cleanup levels, they will be substituted for the cleanup levels. Collectively, the cleanup levels will attain the $1x10^{-4}$ to $1x10^{-6}$ risk level as required by the NCP.

Added protection to human health and the environment will be assured through the installation of a RCRA-type cap on the landfill (Alternative LF #3b). The installation of the cap, along with proper maintenance practices, is a reliable method to alleviate the direct contact threat from the site's contents and will also help in reducing leachate generation, thereby reducing the amount of contamination reaching the groundwater.

In addition to the remedial actions of the enhanced bioremediation/fixed-film bioreactor, and LF #3b, the land and groundwater use restrictions as set by Alternatives GW #2 and LF #2 will further assure protection to human health and the environment. The institutional controls as described in the selected remedy will reduce the likelihood of activities occurring on-site that may damage the site's cap and will prohibit the installation of water supply wells in the area affected by contamination from the Facility.

There will be no unacceptable short-term risks or cross-media impacts caused by the implementation of the groundwater portion of the selected remedy. Some short-term risks will be created by the installation of the landfill cap but these risks are similar for the cap alternative chosen and those not chosen. The risks due to the installation of the new landfill cap should be minimal if proper installation practices are followed.

B) Compliance with ARARs

The selected remedy will be designed to meet all applicable, or relevant and appropriate requirements (ARARs) of Federal and more stringent State environmental laws. A list of probable ARARs relating to the remedial action alternatives, selected and not selected, at the West KL Avenue Landfill are summarized in Table 6 of this ROD.

The major ARARs that will be addressed and met (or waived on the grounds of technical impracticability) by the selected remedy and whether the ARARs are applicable or are relevant and appropriate are listed as follows:

Groundwater:

Federal:
Safe Drinking Water Act; Maximum Contaminant Levels will be attained in the groundwater through groundwater pump and treat at and around the Facility.

State:
Preselected remedy will meet the requirements of a Type B cleanup under MI Act 307 (Michigan Environmental Response Act).

MI Act 368 of 1978 (Public Health Code), specifies the procedures for water well abandonment.

MI Act 315 of 1969 (The Mineral Well Act), states the requirements of monitoring wells at a site. (applicable)

Landfill Closure:

Federal:
40 CFR Part 264.310, RCRA Subtitle C, regulations for owners/operators of hazardous waste facilities regarding closure and monitoring.

State:
MI Act 64 of 1979 (The Hazardous Waste Management Act), Parts 2-6, regulates the treatment, transportation and disposal of hazardous wastes. States requirements of landfill closure and monitoring. (Note: This is not the ARAR regarding the clay thickness of the cap. Only 2 feet of compacted clay will be required by the selected remedy

and not the 3 feet as stated in this Act. The 3rd foot will be replaced by a 60-mil HDPE liner and will be as effective or more effective than the foot of clay it is replacing.)

Air:

Federal:
Clean Air Act, Regional air pollution program addressing air emissions.

40 CFR Part 50, National primary and secondary ambient air quality standards regarding the particulate standards that apply to dust generating construction activities.

State:
MI Act 348 of 1965 (The Air Pollution Act), requires air emissions from devices or site work to be "non-injurious", to be in compliance with promulgated state air emission regulations.

Residual Disposal:

Federal:
40 CFR 268, Land Disposal Restrictions, regulates manifesting, shipment and off-site disposal of wastes that exhibit RCRA toxicity characteristics.

Discharges:

Federal:
National Pollution Discharge Elimination System (NPDES), regulates the discharges into surface water bodies. This will be the responsibility of the City of Kalamazoo POTW as per their permit to discharge into the Kalamazoo River. If discharge is conducted through a retention pond on or near site, NPDES regulations must be complied with.

State:
MI Act 245 of 1929 (The Water Resources Commission Act), Part 9, states the requirements for discharge to sanitary sewer system. Part 21, states the effluent discharge permitting and monitoring requirements. (See Page 15, Section VII.C. of this ROD regarding MI Act 307 satisfying the requirements of MI Act 245.)

C) Cost-Effectiveness

The selected remedy, including Alternatives GW #2 and the enhanced bioremediation for groundwater, and LF #2 and LF #3b, is considered cost effective in that it produces the same or more protection than the other alternatives evaluated at similar or only slightly higher costs. Cost comparisons for each alternative is presented in Table 7 and the cost for the bioremediation are summarized in Table 8. Portions of the costs within the limited action alternatives, GW #2 and LF #2, will be duplicative of costs within the remedial action alternatives, so the costs relating to the limited action alternatives will be somewhat lower than what is presented. Selected Alternative, enhanced bioremediation/fixed-film bioreactor is the groundwater remedial action alternative lowest in total present worth, while also providing protectiveness to human health and the environment and meeting ARARs. Of the landfill remedial action alternative, the selected remedy, LF #3b, is not the lowest in total present worth but it will allow up to 78% less leachate generation than the less costly LF #3a, for only an estimated 17% increase in cost. Therefore, alternative LF #3b is considered cost-effective when compared to the extra benefits it provides towards protectiveness to human health and the environment.

D) Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable

The alternatives chosen represent the best balance of alternatives evaluated to address the contamination problems found at the West KL Avenue Landfill, provide protection for human health and the environment and attain ARARs. The selected remedy will address the contaminants found in the groundwater, at and around the Facility, will reduce the generation of leachate within the landfill, therefore reducing the amount of contaminants reaching the groundwater, and will implement several institutional controls which will further provide protection to human health and the environment. Of the alternatives that comprise the selected remedy, only the treatment of the groundwater offers any degree of permanent solutions, utilizing treatment technologies. The use of the enhanced bioremediation/fixed-film bioreactors will treat and or destroy the contaminants so that they no longer present a hazard to human health or the environment. The selected alternative for the landfill cap is not a permanent remedy and will require appropriate amounts of monitoring and maintenance to assure the effectiveness of the cap. The selected remedy represents the maximum extent to which permanent solutions and treatment can be utilized for this action. Due to the large quantities of waste within the West KL Avenue Landfill, and the discovery of no "hot spots" within the landfill, alternatives involving the treatment or removal of the wastes were deemed impracticable and were not carried forward.

E) Preference for Treatment as a Principal Element

The principal threat posed by the West KL Avenue Landfill is the presence of contaminants in the groundwater in concentrations that exceed acceptable human health risks (refer to Section V and VI of this ROD and the RI Report). The selected alternative directly addresses this principal threat through treatment on-site with enhanced bioremediation/ fixed-film bioreactors. If the enhanced bioremediation does not treat the groundwater sufficiently enough to meet MI Act 307 goals and other ARARs, alternative remedial action alternatives, as described in the FS and above, also preferring treatment as a principal element, may be implemented.

TABLE 8

Table C-2.1. Cost Analysis for Ground-Water Collection and Fixed Film Bio-Treatment; West KL Avenue Landfill, Kalamazoo, Michigan

Task/Description	Quantity	Unit Cost($)	Total Cost($)[a]
Capital Cost			
Site Preparation			$ 30,000
Pre-engineered Building[a] (includes process piping, valves, HV, etc.)			97,000
Bioreactors	6	60,000	360,000
Support Media	6	8,500	51,000
Recovery wells (includes submersible well pumps)	5	25,000	125,000
Conveyance Piping (from recovery wells to treatment facility)			97,000
Reinjection wells	3	15,000	45,000
Conveyance Piping (from treatment facility to reinjection wells)			20,000
Electrical and Instrumentation			50,000
CONSTRUCTION SUBTOTAL			875,000
Health & Safety Contingency (10%)			87,500
Construction Contingency (30%)			126,600
Construction Oversight (LS)			262,500
CONSTRUCTION TOTAL			$1,351,600
Engineering Design (7%)			94,600
Legal (5%)			65,600
Construction Services (2%)			27,000
TOTAL CAPITAL COST			$1,538,800

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TABLE 8

Table C-2.1. Cost Analysis for Ground-Water Collection and Fixed Film Bio-Treatment; West KL Avenue Landfill, Kalamazoo, Michigan (continued)

Task/Description	Quantity	Unit Cost($)	Total Cost($)[a]
Annual Operating Cost			
Electrical Power			$ 14,000
Plant Operation[iii]			35,000
System Maintenance (considers periodic repair or replacement of mechanical and electrical components)			15,000
Monitoring/Laboratory Services			16,000
TOTAL ANNUAL OPERATING COST			80,000
Present Worth (10% Discount Rate for 18 Year Treatment Cycle = 8.201)			656,000
TOTAL PRESENT WORTH			$2,195,000

Notes:

i) Construction cost estimates are based on Geraghty & Miller project notes and data from the USEPA FS. All contingencies are provided by USEPA and reproduced here for consistency. An accuracy of +50 percent to -30 percent is assumed as recommended in the "Guidance for Conducting Remedial Investigation and Feasibility Studies Under CERCLA."

ii) The costs for the 10,000 square foot pre-engineered building including the concrete slab on which the equipment will be placed are from the 1990 Means Building Construction Cost Data Sections 051-235-0110 and 033-130-4760.

iii) Assumes one operator working approximately 20 hours per week.

XI. DOCUMENTATION OF SIGNIFICANT CHANGES

The overall goals of the remedial action as stated in the U.S. EPA's Proposed Plan have not changed. The only significant change to the Proposed Plan that was made within this ROD, is the replacement of the remedial action to address the groundwater contamination. Based on comments received from PRP's and the community, the preferred groundwater alternative was changed from the use of the POTW, with the contingency of using UV-enhanced oxidation if the use of the POTW was not agreeable with the City of Kalamazoo, to the use of enhanced bioremediation/fixed-film bioreactors. The specifics of the enhanced bioremediation alternative are described above and detailed further in the report by G&M, "Review of U.S. EPA Proposed Alternatives and Proposal of Additional NCP Compliant Remedial Alternatives for Implementation at the West KL Avenue Landfill". The goals of the groundwater remedial action have remained the same and are described above. The public comment period in which comments on the U.S. EPA's Proposed Plan and FS ran from June 11, 1990 through August 10, 1990.

XII. SUMMARY

The presence of groundwater contamination at and around the West KL Avenue Landfill requires that remedial actions be implemented to reduce the risk to public health and the environment. The U.S. EPA believes, based on the RI/FS and the Administrative Record, that the selected alternatives provide the best balance of trade-offs among alternatives with respect to the criteria used to evaluate the remedies. Based on the information available at this time, the U.S. EPA believes that the selected remedy will be protective of human health and the environment, will attain ARARs and will utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable.

The total estimated costs for the selected remedy at the West KL Avenue Landfill are as follows:

Alternative	Total Capital Cost	Total O&M, 30yr.	Total Present Worth
GW #2	$ 4,200	$ 141,400	$ 145,600
Enhanced Bioremediation	$ 1,538,800	$ 656,000 (18 years)	$ 2,195,000
LF #2	$ 162,400	$ 151,700	$ 314,100
LF #3b	$11,601,600	$ 150,800	$11,752,400
TOTAL	$15,307,000	$1,099,900	$16,407,100

ATTACHMENT 1

STATE OF MICHIGAN

JAMES J. BLANCHARD, Governor

DEPARTMENT OF NATURAL RESOURCES

STEVENS T. MASON BUILDING
P.O. BOX 30028
LANSING, MI 48909

DAVID F. HALES, Director

September 28, 1990

Mr. Valdas Adamkus, Regional Administrator
U.S. Environmental Protection Agency
Region V, SRA-14
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr. Adamkus:

The Michigan Department of Natural Resources (MDNR), on behalf of the State of Michigan, has reviewed the proposed Record of Decision (ROD) which we received on September 19, 1990, for the West KL Avenue Landfill Superfund site in Kalamazoo, Michigan. The remedy in the proposed ROD consists of groundwater extraction and treatment, containment of the landfill, fencing, well replacement, and institutional controls.

We agree with the selection of groundwater extraction and treatment as part of the remedy for the site. However, we do not agree with the groundwater treatment system proposed. Our staff review of enhanced bioremediation using a fixed film bioreactor indicates that there is no evidence to support the theory that a bioreactor, or bioremediation in any form, substantially treats Vinyl Chloride, which has been found in the groundwater. We agree that the groundwater treatment system must meet the cleanup goals for the indicator compounds which are shown on Table 5 in the proposed ROD. These goals are consistent with Type B criteria for our Act 307 Rules.

The State has submitted the Water Resources Commission Act and the Part 22 Rules as applicable or relevant and appropriate requirements (ARARs) for this remedial action for the following reasons. First, hazardous substances in the aquifer beneath the site are migrating to degrade previously uncontaminated groundwater which is prohibited by the Act. Second, one element of the selected remedial action is discharge of purged, treated water back into the groundwater through reinjection wells which is a direct groundwater discharge regulated by the Part 22 Rules.

It is the State's position that the selected groundwater treatment system will not meet the substantive requirements of either the Act 307 Rules or Act 245 Part 22 Rules and will therefore not meet ARARs. We do not concur with the proposed groundwater treatment system.

We concur with the remaining elements of the selected remedy for groundwater shown in the ROD. These include: continued groundwater monitoring of the shallow and deep aquifers, including the installation of additional groundwater monitoring wells; deed restrictions on the use of the shallow aquifer as a drinking water source until the cleanup standards are achieved; and proper closure of the residential wells that were replaced in the early 1980's.

In addition, we concur with the selected remedy for the landfill, which includes: construction of a six foot chain link fence around the perimeter of the landfill; posting no trespassing and warning signs around the perimeter of the fence; placement of deed/use restrictions prohibiting the construction of buildings or other structures on the landfill property without prior consent; and containment of the landfill using a RCRA-type cap.

The State acknowledges that CERCLA Section 104(c)(3) requires that the State pay or assure payment of 50 percent of any sums expended to respond to a release at a facility, that was operated by the State or a political subdivision thereof, either directly or through a contractual relationship or otherwise, at the time of any disposal of hazardous substances therein. Such payments will be the subject of requests for appropriations from the Michigan legislature which has the sole power to authorize expenditure of State money.

If you or your staff have any questions, please contact Mr. Peter Ollila at 517-373-8174, or you may contact me directly.

Sincerely,

Del Rector

Delbert Rector
Deputy Director
517-373-7917

cc: Dr. James Truchan, MDNR
Mr. William Bradford, MDNR
Mr. Peter Ollila/West KL Avenue Landfill File

ATTACHMENT 2

RESPONSIVENESS SUMMARY

WEST KL AVENUE LANDFILL
KALAMAZOO, MICHIGAN

The U.S. Environmental Protection Agency (EPA) has gathered information on the types and extent of contamination found, evaluated remedial measures, and has recommended remedial actions to address the contamination found at and near the West KL Avenue Landfill, located just west of Kalamazoo, Michigan. As part of the remedial action process, two public meetings were held at the Oshtemo Township Hall. The first was an availability session, held July 16, 1990, and it was attended by about 30 people. The second was a public hearing, held July 23, 1990, and attended by nearly 60 people. The purpose of the meetings was to explain the intent of the project, to describe the results of the Remedial Investigation (RI) and the Feasibility Study (FS), and to receive comments from the public. A court reporter was present to record the proceedings of the second public meeting. A copy of the transcript is included in the Administrative Record.

Public participation in Superfund projects is required by the Superfund Amendments and Reauthorization Act of 1986 (SARA). Comments received from the public are considered in the selection of the remedial action for the site. The Responsiveness Summary serves two purposes: to provide EPA with information about the community preferences and concerns regarding the remedial alternatives and to show the community how its comments were incorporated into the decision-making process. Comments regarding information specifically contained in the RI are not addressed in this Responsiveness Summary because this information is contained in the reports available in the Kalamazoo County Public Library, Oshtemo Township Branch, and at the Oshtemo Township Hall.

This document summarizes the oral comments received at the public meeting held July 23, 1990, and the written comments received during the public comment period, which ran from June 11, 1990 through August 10, 1990. Please refer to Appendix A for a list of the commenters.

The comments have been summarized as follows:

<u>Comments from State Legislature:</u>

Comment #1:

1.1. It seems appropriate that the government and community seek to minimize potential future exposure with a reasoned, cost-effective approach. EPA and the Michigan Department of Natural Resources (MDNR) have recommended that the landfill be fenced and bare spots be covered. I would concur with that recommendation and, in addition, suggest that on a short-term basis it may be advisable to post "no trespassing" signs (particularly during construction and the initial monitoring). However, neither EPA nor MDNR should foreclose the beneficial use of the site for a nature habitat, nature trails or similar uses which do not jeopardise the integrity of the landfill cover.

1.2. I believe a goal orientated, flexible approach must be taken which considers the inter-relationship of the parts to the total remedy proposed for the site. I believe a clean-up protective of the environment can be achieved, but I do not think the Rules to Act 307 would require type A standards for all aspects of the clean-up. I ask that EPA and MDNR reconsider the proposed cap and groundwater remedy in light of the following comments.

1.3. The proposed remedy, a Resource Conservation Recovery Act (RCRA) cap, is said to be 87 times more effective in reducing leachate than the MI Act 64 cap, but this comment does not take into consideration the inter-relationship between the cap and the proposed groundwater treatment system.

1.4. First, the proposed remedial plan does not consider the cost effectiveness of the combined cap and groundwater treatment system. Specifically, the MI Act 64 cap is estimated by EPA to cost \$11.4 versus \$13.7 million for the RCRA cap. It does not appear that EPA or MDNR have evaluated the combined remedial proposal to determine whether the \$2.3 million savings through installation of the MI Act 64 cap would result in only a marginal increase in the operation and maintenance cost of the groundwater treatment system. The cost to construct the cap is an immediate expenditure of money, whereas the cost to provide operation and maintenance on the groundwater treatment system is an expenditure in the future. The compounding effect on \$2.3 million held for six years results in almost doubling of that sum, yet it does not appear that either the EPA or MDNR have determined how much longer, if any, a groundwater treatment system would operate if a MI Act 64 cap were installed.

1.5. Second, the Alternatives Array Document (AAD) does not consider an Act 641 municipal cap. This site is principally a municipal landfill, not unlike numerous other sites throughout Michigan. If EPA and MDNR intend to impose hazardous waste standards at municipal landfills, the result will be to place a significant financial burden on Michigan state and local governments, businesses and residents. Again, if the principal focus of the cap is to reduce the cost of groundwater treatment, the EPA and MDNR should evaluated the amount of rainfall infiltrating the landfill under each cap scenario and the duration of the pump and treat system under each treatment scenario, including the scenario under the present cap, a municipal landfill cap, and those caps considered in the AAD.

1.6. Third, I am particularly concerned with the volumes of materials required for construction of the proposed RCRA cap. The FS states that 904,500 cubic yards of material will be required to construct a five and one-half foot cap over the existing cap at the landfill. Any proposal to cap the landfill should take into consideration the existing cover on top of the waste. Furthermore, the proposal to cover the landfill with such extensive volumes of soil and gravel will cause serious disruption to the neighborhood over the entire two to five years EPA and MDNR have estimated for the construction period. If it is assumed that each truck could transport 30 cubic yards to the site, this would involve over 60,000 trips to and from the site during the construction period just to deliver materials. It is imperative that EPA and MDNR incorporate to the maximum extent possible the use of on-site and local material to fulfill any capping requirements.

1.7. In regard to the proposed groundwater remedy, I note that the proposed plan prefers discharge to the City of Kalamazoo treatment facility over UV-enhanced oxidation. The cost differential is approximately $3.5 million. As between the two choices, MDNR and EPA were correct in preferring discharge to the City treatment facility. There appears to be no impediment to the facility's ability to operate, handle and treat the discharge once the sewer lines are extended to the landfill. This facility was constructed with state and federal money and designed to handle industrial waste. Since the landfill was used as a county-wide landfill, including the acceptance of waste from businesses and residents in the City of Kalamazoo, I would think that the City would be willing to accept the discharge from the landfill provided it is compensated for its costs.

1.8. Not withstanding the above, I have some fundamental concerns with the EPA and MDNR's selection of the alternative remedy, UV-enhanced oxidation. First, as the Proposed Plan states, the use of UV is an innovative technology and is not as proven as other technologies, especially on such a large scale as will be needed here. The report also states that the "long-term effectiveness" of UV-enhanced technology is not well documented. I am concerned because, not only is the UV technology more expensive than the more traditional technologies, it is also more susceptible to failure. It has been the position of EPA (and presumable MDNR) that the risk of failure should be borne by those parties responsible for the conditions at the landfill. I am opposed to members of this community assuming the cost of a later, second groundwater remediation system which EPA and MDNR have sought to use this community as a test ground for a more expensive emerging technology. It is strongly suggested that if a decision is to proceed with this form of remediation that the community be protected from exorbitant costs over traditional remedies and the potential failure of remedy. Mixed funding is one solution to the problem.

1.9. Second, UV-enhanced oxidation costs almost $2.0 million more than alternative GW #3a which is precipitation, air stripping and carbon absorption. Air stripping technology is a more traditional remedy for remediation of volatile organics in the groundwater. EPA and MDNR appear to have rejected this technology, not for technical reasons, but in favor of developing more knowledge concerning the UV-enhanced oxidation technology. Since the latter technology is considerably more innovative, it is likely to have a greater variation in its actual costs than would the more traditional air stripping remedy. Thus, when EPA and MDNR state that their estimates are accurate within a +50 or -30 percent, there is a greater probability that the UV-enhanced oxidation technology would result in greater expenses than estimated in the preferred plan.

1.10. Third, EPA and MDNR have concluded that the transport of contaminants is much slower than estimated by their analytical model. It attributes this slow migration to biodegradation, both aerobic and anaerobic conditions at the landfill. The report (RI) notes that there is a "rapidly decreasing ..... concentration near the plume margin." The AAD does not include a study of bioremediation. EPA and MDNR should consider more thoroughly the naturally occurring biodegradation of contaminants at the landfill and compare such information to the cost and remediation time of the remedies it has proposed to determine when the groundwater quality of the site will return to drinking water standards. This information should also be determined for the various site capping scenarios. Finally, EPA and MDNR should consider whether an enhanced form of bioremediation might be an acceptable groundwater remedy.

Response #1:

1.1. The purpose of the fence, to be installed around the landfill is two-fold. First it will protect the landfill cap from trespasser activities such as dirt biking, which may destroy the integrity of the landfill cap and secondly, to protect trespassers from exposure to landfill gases from the gas vents and other locations throughout the landfill. EPA agrees that more "no trespassing" signs are required, especially during any construction activity. In regards to returning the landfill into a useful piece of property, such as a nature habitat or trail, these are possible uses of the property in the future, but not in the near timeframe. It is important that the cap be protected from large shrubs and trees whose roots can cause harm to the cap layers. To this end, the landfill will most likely have a monotypic type vegetative cover, primarily short grasses, which may not be conducive to nature habitats.

1.2. The Proposed Plan and the Record of Decision (ROD) are calling for groundwater cleanup levels at the site to achieve MI Act 307 Type B cleanup and landfill cleanup levels at the site to achieve MI Act 307 Type C cleanup. A copy of the anticipated cleanup levels is included in the ROD. This comment is further answered in the paragraphs below.

1.3. The Proposed Plan mentioned that the RCRA cap lessens leachate generation by as much as 78 times more so than the Act 64 cap. In evaluating the caps, the interrelation between the cap and the proposed groundwater remedies were taken into consideration even though both activities have their own action specific ARARs (Applicable or Relevant and Appropriate Requirements) that must be met. In this case, RCRA closure and MI Act 64 dictate what type of closure is required for the landfill and the Federal Safe Drinking Water Act and MI Act 307 dictate what type of groundwater cleanup is required. The two activities, however, are interrelated in that the better the cap, the less leachate generated and, therefore, less contamination reaches the groundwater, which means less pumping and treating of the groundwater will be required over time.

1.4. As discussed in 1.3 above, the interrelationship between the cap and the proposed groundwater remedies were taken into consideration. The RCRA cap was selected over the Act 64 cap based upon its cost-effectiveness. Essentially, the inquiry is whether the alternative remedy represents a reasonable value for the money. In evaluating cost-effectiveness, three effectiveness criteria are first considered: long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; and short-term effectiveness, 55 FR 8728 (March 8, 1990). Then the incremental cost difference of the two alternatives are compared to the incremental differences in effectiveness. In this case, the RCRA cap is 78 times more effective in reducing leachate than the Act 64 cap, yet the costs are relatively comparable at $13.7 million to $11.4 million, respectively. Consequently, the RCRA cap was selected.

1.5. The AAD did present a capping option of less stringency than MI Act 64, one requiring three 6-inch lifts of compacted clay and overlain with 6-inches of topsoil (Alternative 2a under the Containment alternatives within the AAD), comparable to a cap that would be required under Act 641. One of the purposes of the AAD is for the EPA and MDNR to identify their ARARs regarding pertinent remedies as presented within the document. After viewing the AAD, it was determined that Act 641 is an ARAR for landfill closure (as stated within the FS Report) but MI Act 64 was the ARAR governing this particular landfill because documentation exists that the landfill has accepted hazardous wastes. Therefore, the Act 641 cap as described in the AAD was upgraded to the Act 64 cap in the FS. The principal goals of the landfill cover are to attain ARARs, to contain the wastes within the landfill, and to minimize or eliminate percolation of water through the landfill thereby minimizing creation of leachate and contamination of the groundwater. The modeling conducted in the FS shows that the selected RCRA cap reduces the leachate generation up to 78 times better than the Act 64 cap for relatively comparable cost. An additional goal of the cap upgrade is to eliminate the need to pump and treat the groundwater in the future. As compared to an Act 641 cap, the Act 64 and RCRA cap offer better drainage and a frost protection layer, which will further protect the integrity of the cap. In total, 502,000 additional cubic yards of earthen materials are required to construct an Act 64 or RCRA cap than the Act 641 cap, much of which may be obtained locally. To reiterate the ROD, the Act 641 cap does not attain ARARs for closure since it is documented that the landfill did accept drummed and bulk hazardous wastes.

1.6. Any of the caps that attain the ARARs (Act 64 or better) will require large quantities of material to be brought to the site. The FS indicates that the selected alternative, LF #3b, the RCRA-type cap, will require the least amount of earth materials (not counting the filter fabric and the synthetic liner) and still attain ARARs. Also, by choosing the RCRA cap, one foot of compacted clay was eliminated, being replaced by the high density polyethylene (HDPE) liner. The actual amount of material is also being questioned by a number of other commenters, stating that the area to be covered should be 60 acres and not the 83 acres as stated in the Proposed Plan. The 83 acre number stated in the Proposed Plan and the ROD is an estimate based on site drawings and historical aerial photos. The actual size to be covered can be determined later, but the type of landfill cap will not be affected by the size of landfill. If the area to be covered is indeed only 60 acres and not 83, then the capping will cost less than the estimates within the FS and the ROD, and not as much material will be needed to be transported to the site. On or near-site soils can be used during the construction of the selected landfill cap, but the clay utilized for the RCRA-type cap must meet the specifications of MI Act 64 in lifts and in compaction. On or near-site soils can most likely only be used as grading layers or as the clean-fill and top-soil layers.

1.7. No response to comment needed.

1.8. Due in part to comments received during the public comment period, the use of the POTW and the contingent use of UV-enhanced oxidation are no longer the preferred groundwater remedial actions. They have been replaced by enhanced bioremediation using fixed-filter bioreactors as the selected groundwater remedial action. See the ROD for further explanation of the changes due to the selection of enhanced-bioremediation. Also, see responses to Comments #2 and 3 below. The preferred contingent groundwater remedial action, contingent upon the lack of adequate remediation from the enhanced bioremediation system, would include use of the POTW or UV-enhanced oxidation, or other alternatives that may achieve the cleanup goals. Since some of the enhanced bioremediation system may be used in implementing other groundwater technologies, such as UV-enhanced oxidation, (for example, installation of the groundwater injection wells), the cost-effectiveness of the two alternatives will have to be considered at that time. In addition, the POTW's willingness and ability to accept these wastes remain a factor.

1.9. See paragraph 1.8 above.

1.10. See paragraph 1.8 above regarding the use of bioremediation. In regard to the landfill cap, as stated above, the landfill cap is dictated by the requirements of RCRA closure and Michigan Act 64, and does not take into consideration what type of remedy is chosen for the groundwater. Naturally occurring bioremediation, according to the Remedial Investigation, is occurring within the contamination in the shallow aquifer. However, the levels of contamination are still in exceedance of State and Federal ARARs, so groundwater treatment must be implemented to supplement the natural process in addressing these exceedances.

<u>Comments from PRPs:</u>

Comment #2:

2.1. A group of approximately 24 of the Potentially Responsible Parties (PRPs) identified in connection with the site have formed the KL Avenue Committee. One of the activities of this group has been the review and analysis of various studies, assessments, and proposals regarding the site. The Committee (and their contractor) has also developed an alternative remedy proposal which meets all legal requirements and is actually more protective of human health and safety than EPA's proposed remedy.

2.2. The remedy recommended by the PRP group incorporates recognition of the ongoing in-situ bioremediation and monitoring of plume remediation in addition to constructing a municipal cap in an environmentally and fiscally responsible manner. The Committee's proposed remedy is protective of human health and the environment, is cost effective, and meets the legal criteria of CERCLA and the NCP, requirements which the EPA remedy fails to meet. Our proposal reflects not only an understanding of the requirements of CERCLA and the NCP, but also a recognition of the predominant sentiment of the local public in the area of the West KL Avenue Landfill. We believe the group's proposal would also prove more acceptable to the local governments.

2.3. This letter is supported by three separate attachments: 1) "Comments on the Proposed Plan and Feasibility Study for the West KL Avenue Landfill", by Geraghty and Miller, Inc. (G&M), 2) Technical data report "Review of U.S. EPA's Proposed Alternatives and Proposal of Additional NCP Compliant Remedial Alternatives", and 3) a letter from G&M to Randy Sanger, dated August 9, 1990, which forms an executive summary of the technical data.

2.4. This letter and the attachments constitute the formal submission by the group of comments on the draft FS and the Proposed Plan for the West KL Avenue Landfill. These comments are submitted for inclusion in the administrative record file.

2.5. EPA's selection of a remedy, if arbitrary, capricious, or otherwise not in accordance with the law, is invalid, cannot be allowed to stand, and should prohibit recovery of response costs by the Agency. If the Agency selects the remedy currently proposed by the Agency, or any remedy given the current state of the record, such selection will violate the obligation of EPA under CERCLA.

2.6. EPA's decision on remedy would be arbitrary for several reasons. EPA has omitted significant data, including the twice-yearly County data, from its administrative record. As clearly pointed out in the attached technical documents and the attached affidavits of Mr. Woolf and Mr. Balkema, major technical flaws exist in EPA's analysis, such as the improper calculation of landfill size and the improper calculation of groundwater flow. Any decisions based on this inaccurate data base would be arbitrary and capricious.

2.7. EPA has failed to follow the requirements of CERCLA and the NCP and, therefore, any remedy selected at the present time would be selected contrary to law. There are several sections of the statute itself which EPA has ignored. Among other things, CERLCA provides that off-site transport of hazardous substances is to be discouraged. The goal is permanent and significant decreases in "toxicity, mobility, or volume of the hazardous substance....", EPA is to consider long-term maintenance costs, and EPA is to consider the "potential threat to human health and the environment associated with ...... transportation, and redisposal" as well as those associated with containment. The Agency is to take into account "the degree of support for such remedial action by parties interested in such site." 42 USC § 9621 (b)(1) and (2).

2.8. Since sludges will be created by some of the EPA preferred remedial alternatives and these will be hazardous wastes which will have to be transported off-site, EPA is creating a situation which runs counter to Congress's instructions and, therefore, is not in accordance with law.

> "Remedial actions in which treatment which permanently and significantly reduces the volume, toxicity or mobility of the hazardous substances, pollutants, and contaminants .. are to be preferred over remedial actions not involving such treatment. The off-site transport and disposal of hazardous substances or contaminated materials without such treatment should be the least favored alternative remedial action

where practicable treatment technologies are available. The President shall conduct an assessment of permanent solutions and alternative treatment technologies or resource recovery technologies that, in whole or in part, will result in a permanent and significant decrease in toxicity, mobility, or volume or the hazardous substance, pollutant, or contaminant. In making such assessment, the President shall specifically address the long-term effectiveness of various alternatives. In assessing alternative remedial actions, the President shall, at a minimum, take into account: A) the long-term uncertainties associated with land disposal; * * D) short- and long-term potential for adverse health effects from human exposure; E) long-term maintenance costs; F) the potential for future remedial action costs if the alternative remedial action in question were to fail; and G) the potential threat to human health and the environment associated with excavation, transportation, and redisposal or containment."

42 USC § 9621(b). Under this same section it is mandated that the President select a cost-effective remedy. If the remedy selected would not be a preferred one using the above criteria, then EPA must justify why it deviated from Congress's directives.

2.9. Under another provision of the same CERCLA section, Congress states:

"(d)(4) The President may select a remedial action meeting the requirements of paragraph (1) that does not attain a level or standard of control at least equivalent to a legally applicable or relevant and appropriate standard, requirement, criteria or limitation as required by paragraph (2), if the President finds that -

(B) compliance with such requirement at that facility will result in greater risk to human health and the environment than alternative options; and

(D) the remedial action selected will attain a standard of performance that is equivalent to that required under the otherwise applicable standard, requirement, criteria, or limitation, through use of another method or approach; ..."

42 USC § 9621(d)(4). The Committee's position is even stronger than this passage would suggest. We are not implying that bioremediation will fail to meet ARARs but should be considered in any event. We believe it will meet properly identified ARARs. However, even if in-situ bioremediation did not meet ARARs, EPA could and should still choose it because it will result in a lesser risk to the public than EPA's preferred remedies.

2.10. We wish to emphasize that the group's remedy will meet all the Congressional mandates and be more protective of public health both in the short-term (e.g., no transportation of chemicals to the site, no storage of chemicals on the site, no transport of hazardous waste off the site) and in the long-term (e.g., no long-term disposal off-site of material with more concentrated hazardous substances in it than the material that exists on the site now).

2.11. As is apparent from the above, any review of the draft FS and Proposed Plan is largely technical in nature, but certain analysis, assessment, and comment cannot be adequately identified or explained in the context of primarily technical documents. The following portion of this letter is intended to identify or expand upon other discussions contained in the letter or the attachments, in several particulars. The Committee believes that the Agency must address concerns relating to the evaluation of relative risks posed by remedial alternatives as compared to the risks of existing conditions, deferral of significant decision making to the remedial design phase, identification of cleanup standards, identification and application of ARARs, and factors to be applied in remedy selection.

A. Risk Comparison:

i. CERCLA requires, among other things, that the remedy selected be protective of human health and the environment. To identify a risk to human health as existing, however, is insufficient in and of itself to justify any remedy that will eliminate or minimize such a risk. Implementation of a "remedy" which creates a greater actual risk than the hypothetical risk of existing conditions is not protective of human health as contemplated by the statute.

ii. A comparative risk assessment of limited (or no) action versus each of the various alternatives is noticeably absent from the FS. It is necessary to give consideration to this relationship since limited action is nominally, at least, an alternative. To presume that some action will be taken skews quantification of the risk. The risk of ingestion of carcinogens is virtually nonexistent at this site. No one has utilized the aquifer as a source of drinking water for years, and the existence of a reliable public water system renders the chance of future consumption virtually nonexistent. This is diametrically opposed to the starting premise of the FS that some action needs to be taken.

iii. For example, a comparison of the risk associated with transportation of capping materials under the EPA preferred alternatives to the hypothetical risk of exposure to the groundwater should be undertaken. We believe that such an assessment will show that EPA's preferred remedy dictates reassessment of the appropriate response.

iv. The revised NCP, in newly crafted Section 300.430(d)(4), discusses the use of baseline risk assessments. The preamble to the rule, which "reflects EPA's intent in promulgating (the) revisions to the NCP", (55 FR 8666) repeatedly dictates the need for the conduct and careful consideration of baseline risk assessments.

v. One central portion of the preamble states that, "(a)s part of the (RI), the baseline risk assessment is initiated to determine whether the contaminants of concern identified at the site pose a current or potential risk to human health and the environment in the absence of any remediation. It provides a basis for determining whether remedial action is necessary and the justification for performing remedial actions ...." 55 FR 8709.

vi. Later in the preamble, the issue is pointedly distilled: " ... When considering current land use, the baseline risk assessment should consider both actual risks due to current conditions and potential risks assuming no remedial action.... EPA is clarifying the language in (the NCP) to indicate that both actual and potential exposure routes and pathways should be considered." 55 FR 8710.

vii. "... 300.430(d)(4) of the rule has been clarified to indicate that both current and potential exposures and risks are to be considered in the baseline risk assessment," and, "... (e)xposure assumptions or other information ... " are items to consider in determining "whether the risks are likely to have been under-or over-estimated. These key assumptions and uncertainties must be considered in developing remediation goals." 55 FR 8711.

viii. EPA guidance states that "EPA considers information both from ATSDR health assessments and baseline risk assessments to get a complete picture of health threats." (Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual, pp. 2-9, 2-10). The authority is clear that EPA is to consider the harm that may arise from the conduct of remedial action relative to the harm from simply taking no action.

ix. In an attempt to quantify risk at contaminated sites, assumptions not necessarily close to reality are made. At KL Avenue, the risk perceived as exceeding acceptable guidelines is based on assumed regular, human consumption of contaminated groundwater. The cleanup, therefore, is to achieve a reduction of organic concentrations in a media cut off from human exposure — i.e. the risk assessment assumes a completed exposure pathway when none exists.

x. The possibility of future exposure or the potential spread of the contamination to a point of exposure must be evaluated, but the hypothetical risk cannot justify the creation of real risks and the expenditure of millions of dollars simply to accelerate by a few years ultimate site remedy. Adoption of the proposed plan will create real and immediate risks to public safety in order to reduce a hypothetical and diminishing future risk.

xi. Given the absence of human exposure to the groundwater due to the availability of a public water supply, the remedy proposed by the PRP group of in-situ bioremediation, ongoing groundwater monitoring, and construction of a municipal landfill cap provides a protective, legal, and cost effective option. Speed of remedy is not an appropriate driving factor in remedial selection where human exposure does not exist and when environmental harm is being remedied, especially where the more speedy remedy creates unnecessary risk.

B. Deferral of Decision Making

i. As noted in other attached documents, EPA's data base on which the proposed plan is grounded lacks necessary information. During the Public Meeting, questions were often answered with a comment to the effect that resolution will be developed at the remedial design phase of the project.

ii. Deferral of selection of a remedy until all necessary and available information is gathered and analyzed is appropriate. Deferral of decisions on details of the implementation of a plan is appropriate. However, deferral of the decision on the basic, underlying remedial concept to the remedial design state is not appropriate. It deprives the public and the PRPs of due process with regard to remedy selection.

iii. CERCLA requires the opportunity for public comment. Adoption of the Agency's proposed plan at this time would cause fundamental decisions to be made outside of the public forum, contrary to the Congressional mandate. Avoiding a decision or failing to resolve basic, underlying questions until the Remedial Design phase simply removes those issues from the public debate. This improper circumvention of the clear obligations of EPA must be avoided. The information developed by the Agency to date does not permit a decision on remedial action to be implemented at this time.

C. Cleanup Standards:

i. EPA has failed to adequately assess and determine appropriate cleanup standards at the site, largely deferring this issue to a later date. The cleanup standards have a significant impact on the appropriateness, effectiveness, and cost of the remedial alternatives.

ii. For example, recently adopted rules under Michigan's Environmental Response Act (Act 307) create different levels of cleanup requirements to address different situations. We submit appropriate remedy selection cannot be made until detailed assessment and determination of cleanup standards in a manner either consistent with or in conformance with the Act 307 is completed, or justification for failure to do so is provided.

iii. These rules establish several different cleanup standards, identified as Types A, B, and C. It is the Committee's view that Type C remedial action may be the most appropriate at this site.

iv. All remedial projects under the Act 307 rules must be protective of public health, safety and welfare and the environment and natural resources. R 299.5601(1). The degree of cleanup required under a Type C project is to be developed on the basis of a site specific risk assessment. Factors to be considered include appropriateness for the site, appropriateness for reasonably foreseeable future property uses and cost effectiveness. R 299.5515.

v. Selection of a remedial alternative requires definition, as specified in the Michigan rules, of the extent of such cleanup which is mandated, i.e. the objective must be identified before the means to achieve the objective can be selected. That definition can dramatically affect the cleanup effort in terms of time, scope and cost. Failure to adequately address this key question in the Proposed Plan simply underscores the Agency's inability to justify any remedial plan based on the administrative record as it now exists.

D. Act 641 as the Proper Capping ARAR

i. CERCLA and the NCP require, foremost, that all the remedial actions be protective of the public health and the environment. A requirement which has been identified as applicable or relevant and appropriate (an ARAR) to a site condition does not necessarily set the cleanup standard, if the ARAR will not adequately assure achievement of this primary goal. See Amoco Oil Co. v. Borden. If two conflicting requirements both appear to be ARARs, it is not necessary that the more protective or stringent of the two be adopted as the cleanup requirement. Rather, the requirement which is chosen must be the one which is most appropriate and is most consistent with the NCP. It should be noted that one aspect of the NCP and CERLCA criteria is cost effectiveness of the remedial action.

ii. Section 121 of CERCLA requires that any hazardous substances remaining on-site at the completion of a CERCLA remedial action must meet any ARAR under federal environmental law or any more stringent requirement under state environmental law.

iii. Potential ARARs are identified by reviewing the federal environmental laws and the environmental laws of the state in which the site is located to identify standards and limitations which may be either applicable or relevant and appropriate to the site's cleanup. Section 121 provides that a state law can be a potential ARAR if it is more stringent than federal law. If a state program is similar to a federal program but is not federally authorized, the two programs must be carefully compared to determine the more stringent requirement.

iv. The final cover requirements for municipal and other solid waste landfills which are contained in the administrative rules for Michigan's Solid Waste Management Act (Act 641) do not have a federal counterpart. Therefore, they are a potential ARAR. EPA has accepted ACT 641 as an ARAR (Table 4-4 of Public Comment FS).

v. This site was not a hazardous waste landfill. Industrial wastes as well as other wastes were accepted consistent with then existing law and regulation. The landfill was permitted and operated according to permit. Acceptance of waste generated by industry does not render a landfill a "hazardous waste landfill" for which RCRA or Michigan Act 64 (Hazardous Waste Management Act) standards are necessary. The Michigan Act 64 rules (R 299,506) states that Act 64 rules apply only to landfills disposing of hazardous waste after January 1, 1980. These rules therefore are not relevant to this site. EPA appears to have accepted this point in its review of ARARs (Table 4-4) but failed to propose a municipal landfill cover.

vi. As noted in the attachments, Act 641 is clearly the appropriate ARAR given the history of this site and the extent of remedial action required. To determine otherwise is to render Act 641 a nullity, since Act 641 caps would never be appropriate.

E. Remedy Selection Factors:

i. The U.S. EPA improperly evaluated the remedial alternatives for the site. The Public Comment FS states that it evaluated each alternative on the basis of nine criteria. It further states that it considered two criteria to be "'threshold' criteria in that an alternative must meet them in order for it to be eligible for selection as a preferred remedy." These 2 threshold criteria are: Overall protection of human health and the environment", and "Compliance with ARARs."

ii. The EPA improperly, 1) concluded that the No Action and the Limited Action groundwater remedy did not meet ARARs; 2) failed to array and/or evaluate remedies which would meet ARARs, and; 3) interpreted the law's ARAR requirement.

iii. CERCLA Section 121 provides, in part, that if hazardous substance, pollutant or contaminant remain on site, the remedial action selected, "shall require, at the completion of the remedial action, a level or standard of control for such hazardous substance or pollutant or contaminant which at least attains such legally applicable or relevant and appropriate standard, requirement, criteria or limitation."

iv. EPA concludes without explanation that the No Action and Limited Action groundwater remedies do not meet 40 CFR which relates to standards for solid waste disposal facilities. However, assuming that EPA is referring to the Subpart F groundwater provision, the requirement to meet ARARs is upon conclusion of the remedial action. EPA failed to evaluate both the impact on groundwater of its proposed landfill capping remedy and naturally occurring bioremediation.

v. Also, EPA failed to evaluate several groundwater remedies (including in-situ bioremediation) and soil remedies (including Act 641 solid waste cover) which meet ARARs. Table 4-4 of the Public Comment FS reveals that an Act 641 landfill remedy meets ARARs. Furthermore, based on the report from G&M, the Table reveals that in-situ bioremediation meets ARARs.

vi. Finally, EPA's evaluation of remedies did not properly consider ARARs. CERCLA provides that an ARAR may be either a level or a standard of control which is achieved at the end of remedial action. For example, a landfill cover would be considered a standard of control and attainments of groundwater MCLs upon completion of remedy a level. Therefore, CERLCA allows achievement of ARARs by either method.

vii. In this instance, the primary purpose of the landfill cover is to protect groundwater. Thus, EPA has chosen two groundwater remedies, both of which are designed to achieve groundwater ARARs. EPA neglected to consider combinations of alternatives, which together meet ARARs. Furthermore, EPA improperly screened out groundwater alternatives that require lower periods of time to achieve ARARs while at the same time underestimating the time period of its selected groundwater remedies to achieve ARARs. CERCLA Section 121 provides that a remedial action need not attain ARARs if, for example, "the remedial action selected is only part of a total remedial action that will attain such level or standard of control when complete, ..."

2.12. The Committee is confident that a remedy can be developed which meets the requirements of CERCLA and the NCP but which will not require the extensive and unwanted disruption to the local community and the potentially unwarranted expenditures on questionable hardware and unproven technology.

Response #2:

2.1. EPA recognizes the group of PRPs that has formed. EPA does not believe the remedy proposed by the group meets all legal requirements or is more protective than the remedy proposed or selected by the EPA. See responses to the rest of Comment #2 below for reasonings.

2.2. This paragraph of the letter states that the EPA's proposed remedy fails to meet the legal criteria of CERCLA and the NCP. It is EPA's position that the remedy does meet the legal criteria of both CERLCA and the NCP. The Proposed Plan and the selected remedy stated within the Record of Decision (ROD) have been established under the guidelines of CERCLA and the NCP. Points in which this comment letter state that the EPA's remedy does not comply with CERCLA and/or the NCP are addressed in the following paragraphs.

2.3. The attachments to the comment letter have been received and reviewed by the EPA.

2.4. This letter is part of the Responsiveness Summary, attached to the ROD for the West KL Avenue Landfill, and has been made part of the Administrative Record for the site.

2.5. The U.S. EPA does not agree with the statements made in this paragraph. As mentioned above and within this response, EPA feels that the selected remedy complies with CERCLA, the NCP, and State requirements.

2.6. Most, if not all of County's data, that was submitted to the EPA, is included in the Administrative Record. Please refer to the Administrative Record Sampling/Data Index for the West KL Avenue Landfill. The index states that the documents are not copied (because of the size of the data files) but may be reviewed at the U.S. EPA Region V Offices in Chicago. As a matter of fact, the PRP's contractor, G&M, did review EPA's file that contained the County's data. The index has several entries regarding the data received from the County; for example, page 2 of the 4/27/88 Sample/Data Index shows that test well results from 1980 until March 1986, from Triemstra-Kal. Co. Bd. of Commissioners was entered into the record. Also, a section of the RI Report, Section 5.4.5, compares RI groundwater data with the data supplied by the Kalamazoo County Health Department. Claims of certain major technical flaws affecting the remedy choices are without merit. Landfill size and groundwater flow calculations have been presented as conservative estimates based on the specific data reported in the RI and FS, so that the estimates would not understate the remedy requirements. Although EPA has stated that the actual groundwater pumping rate can not be determined until a pump test is performed, the groundwater flow data is adequate to determine which groundwater remedy to select. Correspondingly, the landfill size estimate may also be revised based upon further data. In regard to the affidavits of Mr. Woolf and Mr. Balkema, and G&M's claim that the landfill is only 60 acres in size, EPA and its contractor based the size of the landfill on historical aerial photographs and topographic maps. At a minimum, EPA believes the size of the landfill that will be required to be capped is 71 acres. Overlapping of the sides to assure proper capping, and the general topography of the landfill could increase this total. EPA's contractor chose the conservative number of acres to be capped at 83.

2.7. EPA has followed the requirements of CERCLA and the NCP. The commenter cites to several CERCLA and NCP provisions and addresses them in subsequent paragraphs. EPA's specific responses are provided in the following paragraphs. The description of the NCP requirements is more accurately provided in the NCP, 55 Fed. Reg. 8702 (March 8, 1990). The NCP provides nine remedy selection criteria to assess whether a proposed remedial plan is consistent or complies with the NCP. Id. The NCP also provides procedures in applying the criteria and explanations of these criteria. Furthermore, off-site transportation of hazardous wastes is discouraged by the EPA, but that does not mean that off-site transportation is not acceptable. This alternative would be considered in the context of the nine selection criteria. EPA has not ignored any provisions of CERCLA or the NCP in selecting the remedial action for this site. The Proposed Plan and the ROD describe how each of the points raised in this paragraph was addressed.

2.8. The commenter cites to the NCP and CERCLA criteria preferring the remedial alternative which reduces the volume, toxicity or mobility of hazardous substances, pollutants and contaminants through treatment. However, this criterion does not stand alone. It is one of five criteria weighted against one another to determine which of the alternatives satisfying the two threshold criteria will constitute the preferred alternative. 40 CFR 300.430(f)(1)(i), 55 Fed.Reg. at 8850. Consequently, simply by disposing of wastes off-site as a result of treating groundwater at the site, does not make the proposed remedy or the selected remedy "not in accordance with the law." EPA prefers to be able to permanently treat wastes on-site, but this cannot always be accomplished. In cases where hazardous substances, pollutants, or contaminants need to be transported off-site, Section 121 (d)(3) of CERCLA states, "In the case of any removal or remedial action involving the transfer of any hazardous substance, or pollutant or contaminant offsite, such hazardous substance or pollutant or contaminant shall only be transferred to a facility which is operating in compliance with section 3004 and 3005 of the Solid Waste Disposal Act (..) and all applicable State requirements. Such substance or pollutant or contaminant may be transferred to a land disposal facility only if the President determines that both of the following requirements are met: (A) The unit to which the hazardous substance or pollutant or contaminant is transferred is not releasing any hazardous waste, or constituent thereof, into the groundwater or surface water or soil; and (B) All such releases from other units at the facility are being controlled by a corrective action program approved by the Administrator under subtitle C of the Solid Waste Disposal Act." In addition to these restrictions any sludges or residuals produced by the onsite treatment will need to be tested to determine whether they exhibit the RCRA toxicity characteristic (TC) for constituents regulated by the Land Disposal Restrictions (LDRs) as cited in 40 CFR 268. EPA has fully discussed the remedy selection criteria in the Proposed Plan and the ROD.

2.9. The cited provision provides EPA with complete discretion, in contrast to a legal requirement, to select a remedy which does not comply with one of the threshold criteria, where EPA makes a specified finding. EPA has not made any of the specified findings cited by this comment. In particular, there is no indication that implementation of the proposed or selected remedy will produce any greater risk to human health or the environment than any of the other alternative options. The sludges produced by groundwater treatment should be in a stable form and, if handled, transported, and disposed of properly, will not create any risk, associated with toxicity, greater than the risk presented by the contaminants presently found within the groundwater. Therefore, ARARs will be met by the selected remedy even if sludges or other treatment derived wastes need to be further treated or disposed of offsite.

In regard to Section 121 (d)(4)(D), if an alternative is shown to attain a standard of performance that is equivalent to that required under the otherwise applicable standard, requirement, criteria, or limitation, through the use of another method or approach, then it may be selected in place of the ARAR compliant alternative. The alternative proposed by this comment, in-situ bioremediation, has not been shown to be to be equivalent in performance to that of the EPA's proposed or selected remedy, or any other ARAR compliant remedy. The in-situ bioremediation alternative, as proposed by this comment, is the same as no action in regards to the groundwater contamination, since the contamination is allowed to naturally attenuate. On this Basis, the risk caused by the contamination within the groundwater will be the same as what is presented within the Risk Assessment in the RI and this shows that if no-action (or in-situ bioremediation) is taken, the risk levels will be above acceptable state and federal levels. EPA has, however, chosen to consider an enhanced form of the bioremediation as its selected remedy. See the ROD for the details regarding the selected remedy.

2.10. EPA does not agree that the group's remedy of in-situ bioremediation will meet all the Congressional mandates and be more protective of public health than the EPA's selected remedy as discussed in responses to this comment. In addition, the group's proposed remedy of an Act 641 equivalent landfill cover does not comply with the proper closure of a landfill that accepted hazardous wastes (Michigan consistently has applied their Act 64 closure regulations on landfills, such as West KL Avenue Landfill, that have accepted hazardous wastes), nor does it adequately address the contaminants that exceed drinking water standards as set by the Federal Safe Drinking Water Act or Michigan Act 307. Also, see the response to 2.9.

2.11. Responses to comments within this paragraph are broken down into the following:

A. Risk Comparison

i. Both federal and state regulations state that a selected remedy will be protective of human health, welfare, and the environment. To determine if a remedy is warranted, actual or potential risks are evaluated, as done within the Risk Assessment portion of the RI. At the West KL Avenue Landfill, both actual and potential risks have been found to be unacceptable to both the EPA and the MDNR. The risk is not considered hypothetical but real, because contamination is in the groundwater, which at one time was suitable for drinking but is no longer. EPA does not believe that its selected remedy will create a greater risk than presented by the contamination at the site.

ii. The combination of the Risk Assessment in the RI and the FS adequately addressed the limited and no action alternatives. The NCP requires a "site specific baseline risk assessment to characterize the current and potential threats to human health and the environment that may be posed by contaminants migrating to ground water..." The Public Health/Environmental Risk Assessment, Chapter 7 of the RI Report, represents the baseline risks present at the site now and if no remedial action is conducted at the site. See also Section 1.3.3 of the FS. The baseline risk assessment demonstrates that both the carcinogenic and non-carcinogenic risks substantially exceed "acceptable" risk levels. The EPA firmly believes that both the No Action alternative and the Limited Action alternative will not address the present and future risks at this site and, therefore, the Risk Assessment represents the comparative risk assessment for these alternatives. Consequently, EPA has determined that since neither the No Action or the Limited Action achieves the ARARs for the site, as mentioned in Section 4.4.2 of the FS, that these alternatives would not be as protective of human health, welfare, and the environment as would the alternatives that include some degree of remedial action. In regard to the statement within this comment that no one has utilized the aquifer as a source of drinking water for years, indicates that the problem is serious since this aquifer once was a source of drinking water for the surrounding community. According to the guidelines within the NCP, the groundwater at and near the site may be classified as a Class II-A aquifer, groundwater that is currently being used as a drinking water source, and treatment is preferred. The aquifer is not being utilized in the immediate area of the site, but it is utilized both up and down gradient of the site. According to CERCLA and the preamble of the NCP, EPA must consider the current as well as potential uses of the groundwater. Natural attenuation (as would be in a No Action or Limited Action alternative) is generally recommended only when active restoration is not practicable, cost-effective, or warranted because of site conditions (such as Type III aquifers), or where natural attenuation is expected to reduce the concentration of contaminants in the groundwater to the remediation goals in a reasonable timeframe. EPA does not believe any of these conditions or situations are present at the site.

iii. Although EPA is concerned with any risk that may be associated with the truck traffic that will be caused by the capping of the landfill, that type of risk cannot not be compared to the risk that is caused by the contaminants at the site. See 40 CFR 300.430(d)(4), where the risk assessment is to characterize the risk "posed by contaminants migrating to ground water ..." The risks caused by the extra truck traffic will be temporary (lasting the 2-3 years that the landfill cap installation will take) and should cause minimal additional risks to residents if proper driving precautions are taken, as should be whenever one drives. The risks presented by the contaminants present within the groundwater will likely continue unless some remedial action is taken to correct the problem. EPA's ROD describes the method in which the remedy was selected to address the contamination at the site.

iv. The RI Report, Chapter 7 contains the baseline risk assessment for this site.

v. No response to comment needed.

vi. No response to comment needed.

vii. No response to comment needed.

viii. EPA is concerned with any harm or disruption to the community which may be caused by the implementation of the selected remedy, and EPA tries to minimize these additional risks and disruptions when selecting a remedy that is still protective of human health, welfare, and the environment, and attains ARARs. However, the "[r]isk assessment provides a consistent process for evaluating and documenting threats to human health and the environment posed by hazardous materials at the site", NCP Preamble 55 FR 8709. The baseline risk assessment is specifically to document existing and potential threats posed "by contaminants." 40 CFR 300.430(d)(4).

ix. The EPA must make conservative estimates in developing the baseline risk assessment in order to assure protection to human health and the environment, and in doing so is following the procedures within the Risk Assessment guidance. Even though at present time no one is directly exposed to contaminated groundwater, as the commenter stated in v. above, potential risk must be determined. In addition, the baseline risk assessment is not the proper place to consider institutional controls, if any exist. 55 FR 8710. Consequently, future scenarios such as wells being installed near the site, or the contamination plume spreading either horizontally into areas previously not contaminated or vertically into the deeper uncontaminated aquifer are a concern.

x. As mentioned above in response to paragraph 2.11.A.i., EPA does not consider the risk posed by contaminants to be hypothetical. Contamination is present in the upper aquifer at and near the site, and the upper aquifer in the site area once was used as a source of drinking water by neighboring property owners. According to the NCP, a remedial action for a site must be both protective of human health and the environment and attain ARARs. Cost-effectiveness becomes an issue to be balanced against four other factors (e.g., long-term effectiveness) after it is determined the alternatives being considered have met the protectiveness and ARAR requirements. EPA included in the final NCP its expectations to better articulate the objectives of the program. 55 FR 8707. The Agency expects to return usable "groundwaters to their beneficial uses wherever practicable, within a time frame that is reasonable given the particular circumstances of the site." NCP §300.430(2)(1)(iii)(F). In regards to creating additional risks to public safety, refer to response 2.11.A.viii above.

xi. The options as recommended by the Committee do not attain ARARs, as determined by the EPA and the MDNR, and do not protect human health and the environment. These are the threshold criteria that must be met in order for an alternative to be considered. As mentioned above, the No Action or Limited Action alternatives have been deemed unacceptable as the remedial actions for this site.

B. Deferral of Decision Making

i. The RI phase of the project is meant to obtain general site specific data such as geology and type and extent of contamination. The FS takes this data and develops a number of alternatives to address the particular problem(s) presented by the contamination at the site. The Remedial Design (RD) phase takes whatever remedy was chosen from the FS (or from public comment) and designs how this remedy will best work at the site, taking into account site specifics. Many times, a pilot test of the remedy is required to test the proposed or selected remedy. This can be done during either the FS stage or the RD phase. In this case, some of the site specific details need to be determined during the RD, such as actual area of landfill to be covered, or the actual pumping rate and best location for the groundwater extraction wells.

ii. The public comment period is for the public to have an opportunity to review and comment on the EPA's FS and Proposed Plan and participate in the remedy selection process. The actual design and implementation of the selected remedy comes after the public comment period and after the ROD is signed by the EPA's Regional Administrator. If the selected or contingent remedies have to be significantly changed due to impracticabilities or other reasons discovered during the design phase, any new remedy will again be placed before the public for its review and comment.

iii. The public comment period for the West KL Avenue Landfill extended from June 11 through August 10, 1990. During this period, the public was asked to review and comment not only on the Proposed Plan but also on the FS. The selection of a remedy has been based on the data presented within these documents, along with the documents contained within the Administrative Record, which is also available to the public. Any data that needs to be developed within the RD, such as the pumping rate of the extraction wells, or the number or extraction wells, is extraneous to the actual decision of what alternative should be selected to achieve the cleanup goals as stated by state and federal ARARs. As stated above in 2.11.B.ii, if the selected or contingent remedies are significantly changed because of any implementation problems discovered during the RD, then the public will again have the opportunity to review and comment on any new alternative remedy which may be selected.

C. Cleanup Standards:

i. EPA's Proposed Plan repeatedly stated that the cleanup goals or target cleanup levels are the state and federal ARARs, whichever is more stringent. Table 2-1 of the FS stated probable cleanup levels for the contaminants of concern. The ROD, Table 4, also indicates the cleanup standards that will apply to the remedy.

ii. At the very least, the cleanup goals for groundwater need to meet the standards as set by the federal Safe Drinking Water Act and, if the state has more stringent regulation, generally those must be followed. Newly promulgated Michigan Act 307 establishes 3 types of cleanup levels, Type A (total restoration), Type B (cleanup to $1x10^{-6}$ or equivalent health based levels), or Type C (site specific cleanup levels). For this site, Type B cleanup is selected, as explained in the ROD and in the MDNR's concurrence letter for the EPA's Proposed Plan.

iii. Refer to response 2.11.C.ii above.

iv. Refer to response 2.11.C.ii above.

v. Refer to response 2.11.C.i and ii above.

D. Act 641 as the Proper Capping ARAR

i. The MDNR has consistently applied MI Act 64 to landfills that have accepted hazardous wastes and have been on the National Priorities List (NPL). MI Act 641 and Act 64 are not considered conflicting

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requirements but ones that are in succession to each other. For this site, since hazardous wastes were accepted for disposal at the landfill and the groundwater is contaminated by the wastes within the landfill, Act 64 should and does take precedence over Act 641. If the site accepted hazardous wastes after 1980, then the Act 64 is applicable; if the site accepted hazardous wastes prior to 1980, which is documented at West KL Avenue Landfill, then Act 64 is relevant and appropriate. This is consistent with the requirements of the NCP. Cost-effectiveness is balanced against four other factors only after potential remedies are protective of public health and comply with ARARs. In this case, Act 641, an ARAR since it deals with the closure of municipal solid waste landfills, does not achieve the standards as set by Act 64, the ARAR that is relevant for this site, since the site accepted hazardous wastes, as documented in the Administrative Record. It is also appropriate because there are wastes of high toxicity found at and near the site.

ii. No response to comment needed.

iii. No response to comment needed.

iv. Act 641 is a potential ARAR as stated above in response 2.11.D.i. But Act 64 is also a potential ARAR and is the State requirement that has been determined to be relevant and appropriate for this site.

v. This site was not designed or licensed to be a hazardous waste landfill, but it did accept hazardous waste for disposal. The PRP Committee has even provided the EPA with evidence to this effect, in the attempt to get more PRPs involved in the process. As stated above in Response 2.11.D.i, Act 64 is an ARAR because it is relevant and appropriate. The landfill did not receive a permit to operate from 1974 to its closure in 1979. (In fact, when the landfill was operating the MDNR did order by letter that liquid waste not be accepted after January 12, 1972, but available evidence suggests that liquid wastes continued to be disposed at the site beyond the date of that order. RI Report, Section 1, Page 7/12)

vi. See above responses.

E. Remedy Selection Factors:

i. As per the NCP, §300.430 (f)(1)(i)(A)-(C).

ii. EPA does not agree that the No Action and the Limited Action alternatives achieve ARARs. Please refer to the FS and response 2.11.A.ii above. EPA can not possibly list or array all possible remedies that would achieve ARARs nor is it required to. See 40 CFR 300.430(e)(7)(ii) and 55 FR 8714 (March 8, 1990). The FS presents only those remedies which were determined to best meet the remedial action objectives based on site specific characteristics. EPA does not believe that the law's ARAR requirements have in any way been improperly interpreted; refer to comments above dealing with the ARAR issue.

iii. No response to comment needed.

iv. The FS, Chapter 4, Sections 4.2.1, 4.2.2, 4.3.1, 4.3.2 explain the No Action and Limited Action alternatives for groundwater and landfill containment. Section 4.4.2 and Table 4-4 explain that the No Action and the Limited Action Alternatives for both groundwater and landfill remedies does not achieve ARARs. The landfill cover material, as described in the RI (Appendix A-4, Technical Memorandum RE: Phase III, Test Pit Installation), varies in depth from 0.5 to 2 feet thick and appears to be mostly sandy soil. There is little evidence of compacted clay or hardened bentonite in the areas that were test-pitted. This shows that the No Action for the landfill cap will not suffice, and that the Limited Action alternative would include totally upgrading the cover since the present cap does not even comply with the standards of Act 641. As for No Action or Limited Action in dealing with the groundwater contamination, these situations would result in similar risks as outlined in the Risk Assessment, which are unacceptable, (as described in the RI, FS and in responses above), to the EPA and the MDNR. The landfill cap and naturally occurring bioremediation in the groundwater fail to adequately address existing contaminants in the groundwater.

v. In-situ bioremediation was evaluated by the EPA in the screening process within the FS. At present, bioremediation is naturally occurring within the contamination plume, but the contaminants, after 10 years, are still above acceptable levels. The FS, Figure 2-2, states that in-situ biological treatment would not be effective for the low level contamination found in the site groundwater. The ROD has reconsidered the use of enhanced-bioremediation, however, due in part to the comments received during the public comment period. Please refer to the ROD for details. The argument regarding Act 641 as an ARAR has been discussed in above responses.

vi. This comment, believed to be referencing CERCLA Section 121(d)(4), has misinterpreted CERCLA. ARARs exist for both landfill covers and for the addressing of contamination within the groundwater. These must all be met by the selected remedy. Section 121(d)(4) lists six possible approaches of when not meeting ARARs is acceptable: A) when more work, or an operable unit, will be conducted in the future to complete a remedy, B) compliance with the ARAR would result in greater risk to human health and the environment than other options, C) compliance with ARARs is technically impracticable from an engineering perspective, D) the selected remedial action will equal or better the standard of performance of the ARAR remedy, E) the state has not consistently applied the ARAR, or F) in the case of a remedial action to be undertaken solely under section 104 using the Fund, and the selection of a remedial action that attains ARARs will not provide a balance between the need for protection of public health or welfare, and the environment at the facility under consideration, and the availability of amounts from the Fund to respond to other sites which present or may present a threat to public health or welfare, or the environment, taking into consideration the relative immediacy of such threats. EPA believes that none of the above are applicable in this case.

vii. One of the purposes of the landfill cap is to reduce the amount of contamination reaching the groundwater, but the landfill also needs to be capped to attain the closure requirements that are stated by ARARs (Act 64). The groundwater remedies are designed to accelerate groundwater cleanup to acceptable levels. By placing the Act 64 cap on the landfill, the length of time required to pump and treat the contaminated groundwater has been reduced. EPA, as mentioned above, has reconsidered the use of bioremediation, and has replaced the preferred groundwater remedy, as stated within the Proposed Plan (POTW or UV-enhanced oxidation) with enhanced bioremediation utilizing fixed-film bioreactors. In regards to the citation to Section 121, refer to response 2.11.E.vi above.

2.12. This comment has been answered in the context of responses 2.1-11 above.

Comment # 3: (Attachment to Comment #2 Letter, and supported by the document entitled, "Review of USEPA Proposed Alternatives and Proposal of Additional NCP Compliant Remedial Alternatives for Implementation at the West KL Avenue Landfill"):

A. Groundwater Comments:

3.A.1. The EPA calculation of hydraulic conductivity for the aquifer underlying the site is based on erroneous data. The highest conductivity value determined during the RI (104.7 feet/day) was selected as the basis for establishing groundwater flow rate parameters despite the fact that the RI states that this value is subject to substantial intrinsic error. The EPA is requested to justify selection of the highest conductivity (104.7 feet/day) as the representative value to establish groundwater flow rate parameters.

3.A.2. Analysis by GSM indicates that a more realistic hydraulic conductivity value of 20 feet/day should be utilized to represent the characteristics of the aquifer in the absence of pump results. EPA is requested to justify why the RI did not include a pump test and why, when a number of data were available to derive representative hydraulic conductivity values, a more realistic value of hydraulic conductivity was not selected to establish groundwater flow rate parameters.

3.A.3. There are significant implications in utilizing 104.7 feet/day as the hydraulic conductivity value rather than the realistic value of 20 feet/day. Based on a hydraulic conductivity value of 104.7 feet/day, the EPA determined that for the remedial alternatives incorporating groundwater recovery, the resultant groundwater recovery rate would be 2,000 gallons per minute (gpm). Utilizing a more realistic value of 20 feet/day, GSM determine that the resultant recovery rate would be approximately 500 gpm. It is requested of EPA to identify how this significant difference in the estimated groundwater recovery rate would impact the number of required extraction and reinjection wells, sizing of groundwater treatment units, duration of operation and maintenance, and costs of groundwater recovery and treatment alternatives.

3.A.4. By applying a more representative groundwater recovery rate of 500 gpm, the estimated time it would take to remediate the groundwater would be significantly lengthened. EPA is requested to identify and assess the implications of a substantially lengthened recovery period on the evaluation of groundwater remediation alternatives. In-situ bioremediation should be included as part of the groundwater remediation alternatives that need to be re-evaluated based on a significant increase in the estimated time required to remediate the groundwater utilizing pump and treat technology.

3.A.5. EPA has proposed a capital and operating intensive remedy for groundwater that incorporates 5 to 7 recovery wells, 3 re-injection wells, and on-site UV/Oxidation treatment, should discharge to the POTW not be allowed. In light of the data available and the questions regarding the probable rate of groundwater capture, the cost estimates presented for the proposed groundwater remedy may not fall within the goal of providing cost estimates of -30 to +50% of the actual costs incurred over the duration of the remediation effort. EPA is requested to assess the accuracy of the cost estimates for the proposed groundwater remedy considering the implications of a lower, but more realistic, groundwater recovery rate and a longer operating lifetime.

3.A.6. The above mentioned capital and operating intensive groundwater remedy has been proposed by EPA even though there are no known sources of chemical releases, such as bulk liquid or drummed chemical wastes, contained within the confines of the landfill. EPA is requested to justify selection of the proposed groundwater remedy in light of the fact that there are no known sources of chemical releases contained within the confines of the landfill.

3.A.7. EPA has not thoroughly identified the ramifications of discharging any recovered groundwater to the local POTW, which has been identified by the Agency as a viable treatment and disposal option in lieu of on-site groundwater treatment and re-injection. EPA is requested to identify and assess the potential ramifications, including both short- and long-term effects to transmission and treatment capacity, that would result from discharging up to 2,000 gpm of recovered groundwater to the POTW and how these ramifications impact the implementability assessment of the groundwater recovery and treatment alternatives.

3.A.8. The FS discusses cleanup objectives for the groundwater as a function of recovering the groundwater at a flow rate of 2,000 gpm over a 6 year period. EPA is requested to explain how the groundwater cleanup objective was devised and to what degree it reflects the enforcement of ARARs.

3.A.9. Based on the data presented in the RI, as well as recent groundwater sampling data, the concentrations of contaminants in the groundwater show a definite decreasing trend. This decreasing trend, which occurs over the full areal extent of the plume of affected groundwater, is most likely the result of naturally occurring biodegradation. EPA is requested to justify why in-situ bioremediation, which is highlighted in EPA's SITE Program and offers the benefits of in-situ reduction to the toxicity, mobility, and volume of hazardous contaminants, was not analyzed as a viable groundwater remediation alternative in the FS.

3.A.10. Despite the fact that substantial data exist documenting continuing improvement in groundwater quality within the extent of the plume, the FS does not consider the impacts or implications of ongoing in-situ bioremediation. In-situ biological treatment can be viewed as innovative and proven when compared with above-ground reactor-based treatment. EPA is requested to answer whether the effectiveness of naturally occurring biological treatment is diminished by the fact that it is not overtly driven by costly mechanical influences.

3.A.11. On-site, above-ground reactor-based biological treatment is a viable treatment alternative for removing the contaminants contained in the groundwater at the West KL site. This technology has been documented to be effective in other related applications. In addition, since in-situ biological degradation is occurring in groundwater underlying the site, it is intuitive that above-ground reactor-based biological treatment would be effective for any recovered groundwater. EPA is requested to justify why above-ground reactor based biological treatment was not given further consideration during the FS.

3.A.12. EPA is requested to determine if naturally occurring biological activity (i.e., in-situ natural bioremediation) meets EPA's expectation for treatment as cited in Section 300.430 of the NCP.

3.A.13. Section 4.1.1. of the Review Report addresses the implications of in-situ natural bioremediation. This process can, on the basis of existing data, be projected to result in protection of public health and the environment and attainment of ARARs. Upon further evaluation, the remedy can be considered effective over the long term and will result in reduction of toxicity, mobility and volume of the contaminants in the groundwater. In addition, in-situ bioremediation, either natural or enhanced, would not result in any short-term risks, could be readily implemented, and would be cost-effective. As a result, in-situ bioremediation, either natural or enhanced, is a very viable alternative for groundwater remediation at the West KL site. EPA is requested to provide a full assessment of in-situ bioremediation since it has not been adequately addressed in the documents currently a part of the administrative record file nor was it presented at the public hearing.

3.A.14. The FS evaluates the option of UV-enhanced oxidation of groundwater compounds and this alternative is ranked second in the document. Research done by the Steering Committee indicates that UV/oxidation is experimental, unproven on the scale proposed at the site and for the type of compounds, including 1,1,1 TCA and 1,2 DCA, expected to be contained in the recovered groundwater. The support provided in the FS is not representative of conditions likely to be encountered at the site. Based on a detailed review of this treatment technology, G&M has determined that UV/oxidation technology is inappropriate for groundwater treatment due to the operating conditions and chemical constituents expected at the site. It is requested that EPA provide documentation of full scale usage of UV/oxidation as an effective treatment technology on sites with similar waste chemistry and flow rates as that expected at the West KL site.

3.A.15. Based on G&M's evaluation of UV/oxidation technology for this site, we have serious concerns over the ability to estimate costs within the range of -30 to +50%. EPA is requested to explain how the limited experience with the EPA SITE Program's Lorenz Barrel and Drum site or other sites provides an acceptable confidence level for estimating UV/oxidation technology for treatment of the groundwater at the site.

3.A.16. Costs associated with pH control for the proposed UV/oxidation treatment alternative appear to be omitted from cost calculations. EPA is requested to address how inclusion of appropriate pH control measures affect the costs and maintenance requirements for UV/oxidation technology. In addition, EPA is requested to identify the skill level of the operator required to properly run and maintain the system.

3.A.17. Section 3.2.1 of the Review Report questions much of the basis for considering UV/oxidation as a viable treatment technology for use at the site. Of special note is the fact that iron removal, which would be necessary pretreatment step to protect the UV process, would generate sludge which would be as much as 15 times the mass of actual contaminants removed during the UV process (on a mass per time basis). According to the FS this sludge waste would need to be disposed of as a hazardous waste. EPA is requested to assess how this significant generation of sludge, which may be classified as a hazardous waste, is consistent with § 300.430 of the NCP which calls for reduction of toxicity, mobility, and volume of the contaminants through treatment.

B. Landfill/Source Control Comments:

3.B.1. EPA utilized a landfill area of 80 acres for the development and assessment of the various remedial alternatives that incorporate capping of the landfill. However, based on a detailed review of data provided by MDNR as well as engineering drawings which delineate the operating and closure limits of the landfill, G&M has determined that the area encompassed by the landfill is 60 acres. EPA is requested to justify selection of 80 acres as the area representing the extent of the landfill, as opposed to the 60 acre area identified by MDNR, and assess how this discrepancy impacts the evaluation and comparison of the remedial alternatives that incorporate capping of the landfill.

3.B.2. The difference in the area assigned to the landfill cap makes a significant impact on the estimation of increased surface water runoff and reduced leachate generation that would result from capping the landfill.

EPA is requested to identify and assess how a smaller landfill cap area impacts the evaluation of the developed landfill cap alternatives. In addition, EPA is requested to justify why the HELP Model, utilized in the FS to determine the effectiveness of the various cap designs, was not utilized to evaluate the effectiveness of the existing landfill cover.

3.B.3. Due to the significant volume of materials required to construct a RCRA-type cap over the landfill, a heavy volume of truck traffic would be necessitated during implementation of the landfill cap remedy proposed by the EPA. However, the impact on the local community relative to the large volume of heavy truck traffic is not addressed in detail in the FS and Proposed Plan. EPA is requested to identify and assess the impacts associated with the large volume of heavy truck traffic that would be realized during implementation of a RCRA-type cap.

3.B.4. EPA recommends that the landfill be covered with a RCRA-type cap and cites as partial justification, the risks involved with the ingestion of soils by an exposed child. However, an analysis of traffic statistics shows significantly greater risk as a result of transporting cover material to the site, for implementing a RCRA-type cap, than the risk associated with the unlikely event of soil ingestion by an exposed child. EPA is requested to re-evaluate the landfill capping alternatives considering the risks associated with the heavy truck traffic necessitated for each capping alternative.

3.B.5. In light of the dangerous and disruptive implication of hauling huge volumes of cover material to the site, EPA is requested to justify why a less material-intensive capping solution, consistent with the evaluation criteria cited in the NCP, was not evaluated in the FS.

3.B.6. EPA is requested to comment on whether the additional risk and expense of the more voluminous covers, such as a RCRA-type cap, are warranted in light of the expected reduction in infiltration. In addition, identification is being requested on how infiltration reduction relates to health risks.

3.B.7. EPA is requested to summarize the attitude of the public regarding the high volume of heavy truck traffic associated with the more voluminous capping options, such as a RCRA-type cap. EPA is also requested to comment as to what degree the issue of heavy truck traffic, and its associated risks to public health, was addressed during the public comment hearing.

3.B.8. Three cap design alternatives are discussed in the FS based on references to Michigan requirements. All 3 caps exceed the technology requirements provided by the logical ARAR (which is MI Act 641) as it applies to specifications for municipal solid-waste landfill covers. In fact, Act 641 was identified as an ARAR in the FS. In light of the levels of contamination and undefined nature of waste disposed at the site, it appears that the site was improperly classified for the purpose of specifying cap requirements. EPA is requested to justify why a municipal landfill cap was not evaluated in the FS when MDNR records clearly show that the landfill predominantly accepted municipal waste and Act 641 was identified as an ARAR.

3.B.9. The FS did not evaluate existing baseline conditions and the projected leachate volume, based on infiltration through the existing landfill cover, that could potentially affect groundwater quality. Accordingly, the assessment of the inadequacy of the landfill's current cover is unfounded. This omission transgresses the requirement by SARA for the evaluation of the No Action alternative. EPA is requested to justify why the health risks differences between both the no action alternative and an Act 641 cap were not compared to the landfill capping scenarios offered by the EPA. In addition, EPA is requested to justify why the FS did not analyze the degree of capping technologies needed to attain ARARs in the groundwater.

3.B.10. The various covers proposed in the FS as meeting ARARs should be compared to no-action and modification of the existing cap. Tradeoffs between infiltration reduction, cost, and risk are typical in evaluating capping alternatives. The FS and Proposed Plan do not provide a reasonable array of alternatives capable of being engineered for the site. EPA is requested to justify why the FS only evaluated cap technologies that exceed ARARs and did not properly evaluate cap technologies that meet ARARs.

3.B.11. The RI and Risk Assessment do not agree with the FS regarding potential risks associated with exposure to landfill contaminants. It is requested of the EPA to justify why the FS disagrees with the Risk Assessment and, thus, proposed capping technologies with multiple and redundant safety factors?

C. Summary Comments:

3.C.1. The steering committee has developed either additional analysis of alternatives developed by EPA or alternatives not considered which are compliant with the requirements of the NCP but were not considered in EPA's final screening of alternatives in the FS and Proposed Plan. In the event EPA is not inclined to further consider or discuss these alternatives we request that the responsiveness summary address, in detail, EPA's perceived areas of the alternative's non-compliance with requirements of SARA and the NCP.

3.C.2. Included in the Review Report is a matrix evaluating the implications of the nine evaluation criteria specified in the NCP. Based on this analysis, the committee has concluded that in-situ bioremediation coupled with cap upgrade should be the recommended alternative for remediation of the site. EPA is requested to provide detailed comments as to why this remedial alternative would not comply with the NCP.

3.C.3. CERCLA and SARA require that the no action alternative be carried into the final screening phase of the FS. EPA is requested to explain why consideration of the no action alternative in the FS was dismissed with so little evaluation when the Risk Assessment concluded that there are no significant risks associated with air or surface soil exposure and the risks posed by leachate generation were undefined.

3.C.4. Based on the evaluation of the committee and its consultants, it appears that further evaluation of alternatives is warranted prior to remedy selection. Issue of fact and new information are presented such that a response to comments will not be sufficient to allow the required public involvement in any subsequent remedy selection. Accordingly, the committee will review carefully the response to all comments to ensure EPA compliance with public participation requirements of SARA and the NCP.

Response #3:

A. Groundwater Comments:

3.A.1. The hydraulic conductivity, as stated in Appendix B of the FS states that the range of hydraulic conductivity at the site ranged from 0.29 to 104.7 ft/day. The highest value (104.7 ft/day) was used to develop the most conservative approach and to compensate for any errors in the data. Please refer to the FS, Appendix B for further reasoning on the selection of the hydraulic conductivity. The value may not be the best representation of the actual hydraulic conductivity, but it is considered the most conservative value in which to estimate a flow rate. Also, refer to the response to Comment #3.A.8 below.

3.A.2. A pump test is not a required part of a remedial investigation. If a pump and treat scenario is chosen as a remedy, the data gathered from the RI is used to estimate values such as flow rate and pumping rates that may be needed. The actual pump test is most often held off until the design or the conducting of a pilot test, when the need for such an involved test is definitely required. Until such a pump test is conducted, the most conservative approach is followed, by using the highest reported values, then, when the pump test is conducted, more accurate estimates can be established. The true value may well be close to the value stated in the comment or it may vary greatly from the value stated in the comment, or even from one area of the landfill to another.

3.A.3. As mentioned above in response 3.A.2., the value used in the FS is a conservative estimate. By using values such as presented by the comment, or any other value lower than the conservative approach, some changes will occur in the overall pump and treat system. The number of extraction wells may need to change, but the overall width of the plume still will need to be contained/captured, so if a lower pumping rate is used, more wells may be needed to properly cover the plume. The injection wells will be directly proportional to the number of extraction wells and the total gpm. The size of the treatment units is also dependent on the total overall gpm and the time it will take to treat that volume of water. The costs associated with the operation and maintenance of the system may be lower annually, but will most likely cost just as much or more than the estimates within the Proposed Plan due to the length of time that the pumping may be required. Overall, the costs may be somewhat lower for the initial construction and implementation of the pump and treat system, but due to the lower pumping rates, the groundwater will have to be pumped for a longer period of time, so the costs may be comparable or somewhat higher than previously estimated.

3.A.4. See response 3.A.3 regarding the time needed to pump the aquifer. In-situ bioremediation is not a viable remedial alternative for this site since it will not achieve the cleanup objectives. The use of treatment technologies can be implemented to help accelerate the cleanup of groundwater. See the response to Comment #2.11.A.ii.

3.A.5. This comment is no longer pertinent at this time, since the groundwater remedy has been changed to enhanced bioremediation/fixed-film bioreactors, utilizing the cost estimates provided by G&M. The costs of the contingency remedy, i.e., use of the POTW, will be somewhat different if the pumping rates are lower than the EPA's estimated rate of 2000 gpm, but this would not be known until the design stage and the actual rate and duration of the pumping are known. The costs of a contingency remedy, such as the use of on-site UV-oxidation treatment, may be somewhat higher than previously estimated due to the longer period of time; however initial costs of certain components of the enhanced bioremediation may be applicable to a contingency remedy, thereby lowering the contingency cost. For example, both the enhanced bioremediation and the UV-oxidation technologies utilize injection wells or an infiltration pond, while the use of the POTW does not.

3.A.6. The landfill is the known source of the chemical releases in the landfill area, as stated in the RI in regards to the test pits. See response to Comment #2.D.v and the RI.

3.A.7. Basic evaluations are included within the FS, Proposed Plan, and in the ROD. As the ROD states, the selected groundwater remedy is no longer the use of the POTW, but the use of enhanced biodegradation/fixed film bioreactors. If the POTW is to be used, the POTW would be contacted and would have the opportunity to refuse the acceptance of the waste water based on the issues raised in the comment.

3.A.8. The use of 2,000 gpm as the estimated groundwater extraction and treatment rate is primarily the result of using a conservative value of 104 ft/day for the hydraulic conductivity of the shallow aquifer. Groundwater extraction modeling performed in the FS yielded a pumping rate of 1,400-1,700 gpm, and 2,000 gpm was the rate used for sizing and costing treatment equipment. It is stated on page 16 of Appendix B of the FS Report that a pump test is necessary to fully evaluate the feasibility of extracting groundwater and establishing the proper groundwater extraction rate. Because the RI did not define the aquifer characteristics needed to conduct a detailed evaluation of a groundwater extraction system, it was necessary to make certain assumptions as part of a preliminary feasibility determination of groundwater extraction and injection. One of these assumptions was that the highest conductivity value from the RI slug tests is representative of actual aquifer characteristics. As stated on Page 1 of Appendix B of the FS, slug tests results do not generally account for large-scale variations in hydraulic conductivity and can often lead to an underestimation of conductivity. It was therefore desired in the FS to utilize a conductivity estimate that was as large as reasonably possible to initially determine if groundwater extraction was a feasible remedial technology. The conductivity value of 20 ft/day as presented in the G&M Review Report is also based on assumptions obtained from the RI slug test data. Specifically, the assumption that "a safety factor of 3 to 5 times the mean conductivity could appropriately compensate for the tendency of slug tests to underestimate conductivity" is subject to as much uncertainty as any conductivity assumption made in the FS. The issue is not one of justifying a lower extraction rate based on a preselected value used in the FS Report. The extraction rate will remain an undefined value until it is determined by a pump test as recommended in the FS Report. In regard to what degree the flow rate reflects the enforcement of ARARs, the flow rate is only a part of the groundwater extraction system, which as a whole is to be designed to help achieve ARARs.

3.A.9. Refer to the response for comment #2.11.E.v.

3.A.10. Refer to the response for comment #2.11.A.ii. and #2.11.E.v. Also, the RI Report and a summary received from Wilkens & Wheaton Environmental Services, dated August 10, 1990, show that several contaminants, including benzene and lead, are increasing in concentration in several groundwater monitoring wells, which indicates that in-situ bioremediation is not addressing all of the contamination within the groundwater.

3.A.11. The EPA has reconsidered the use of enhanced biodegradation and the use of above-ground bioreactor-based treatment and has selected it as its primary remedy to address the groundwater contamination at the site. Please refer to the ROD.

3.A.12. Yes, naturally occurring biological activity can be termed as a type of treatment as cited in §300.430 of the NCP, but since other treatment technologies can help contain/capture and treat the contaminant plume quicker, treatment technologies other than natural attenuation are favored. In addition, naturally occurring biological activity may not be fully treating contaminants within the plume. Please refer to the response to comment 3.A.10 above.

3.A.13. Please refer to the ROD. Enhanced bioremediation has been selected as the primary groundwater treatment method. Refer to the FS and responses to comments above regarding the use of in-situ bioremediation.

3.A.14. The preferred groundwater remedy, as stated in the EPA's Proposed Plan, has been changed. The ROD has selected the use of enhanced bioremediation as the technology to address the groundwater contamination at the site. If the selected remedy does not achieve the cleanup goals as stated within the ROD, contingent remedies may be selected to replace or supplement the enhanced bioremediation alternative. Comment as stated is no longer pertinent to the ROD at the present time.

3.A.15. See response 3.A.14 above.

3.A.16. See response 3.A.14 above.

3.A.17. Some inorganics may still need to be removed prior to being reinjected into the shallow aquifer to satisfy the requirements of MI Act 307. In regard to the NCP, treatment of any type that reduces toxicity, mobility or volume of waste is in compliance with the NCP. Any sludges or residuals produced as a result of treatment will need to be tested for RCRA toxicity characteristics (TC) for constituents regulated by the Land Disposal Restrictions (LDR). It may be determined that any sludges produced by the on-site treatment may require further treatment prior to disposal off-site.

B. Landfill/Source Control Comments:

3.B.1. 80 acres is a conservative number based on topographical maps and historical aerial photographs showing areas that were filled. Actual landfilled land is probably closer to 70-72 acres, but to account for the topographical features of the landfill and the feathering out of the cap, the conservative number of 80 acres was used. The size of the cap does not make any difference in regard to the evaluation criteria; i.e., the costs would be proportionally lower for each capping alternative should the area to be capped be less than 80 acres. Amounts of truck traffic would also change proportionally for each capping alternative.

3.B.2. Refer to response 3.B.1 above. In regard to the evaluation of the existing cap, please refer to the response to comment #2.11.E.iv.

3.B.3. Truck traffic is a negative part of each of the capping alternatives. Obviously, if there were no further capping, there would be no truck traffic and no risk caused by the excess traffic. But to correctly cover the landfill according to ARARs, and to prevent any further contamination from degrading the area's groundwater, the cap must be installed. The risks caused by the truck traffic is unfortunate and will be kept to a minimum if proper construction and road regulations are followed.

3.B.4. Truck traffic will occur with any of the ARAR-compliant landfill cap alternatives. This traffic is a serious concern to EPA. Less earthen material is required for the RCRA-type cap than for the other 2 ARAR-compliant caps evaluated (FS Table 4-2). As mentioned in above responses, the Act 641 closure does not comply with the MI Act 64 ARAR. Also, see preceding response.

3.B.5. The caps presented by G&M in the Review Report (Act 641 and the maintenance of the existing cover) do not comply with ARARs and therefore do not comply with the intent of the NCP. (See other responses above that address the ARARs for capping of this site.) Only the capping alternatives that would comply with the state and federal ARARs for the closure of hazardous waste landfills (Act 64 and RCRA) were evaluated within the FS.

3.B.6. The RCRA-type cap is predicted to be 78 times better in reducing leachate generation than is the Act 64 cap. G&M's Review Report indicates that the Act 641 cap is also better than the Act 64 cap in reducing leachate generation, which the EPA does not totally agree with. A HELP model performed by G&M states that less infiltration will occur into the landfill with an Act 641 cap versus an Act 64 cap. Although this may be a valid interpretation of the HELP model results, it does not necessarily provide a suitable technical justification for the selection of the Act 641 cap. The Act 641 cap may experience a significant decrease in performance over the long term. Because the Act 641 clay layer is protected by only 6 inches of topsoil, it will be especially susceptible to damage by deep-rooted vegetation, burrowing animals, and most importantly, frost. These factors are not considered by the HELP model; therefore, the actual amount of percolation through the Act 641 cap will most likely be greater than the simulation indicates. As a result, the long-term effectiveness of the Act 641 cap (based on the amount of percolation it allows) may be less than that of the Act 64 cap. Additionally, the Act 641 cap does not satisfy the State of Michigan capping policy that has been consistently applied at similar sites within the state. In regard to how infiltration reduction relates to health risks, the less infiltration allowed through the landfill cover over time, the less contamination that reaches the groundwater. The RCRA-type landfill cover will reduce infiltration more so than either the Act 641 or Act 64 caps.

3.B.7. The responses from the public indicated that it does not believe that the capping and the additional disturbance caused by the truck traffic is warranted at this site. In order to comply with ARARs and to adequately protect human health, welfare and the environment, the cap upgrade must be performed. As mentioned in a response above, if proper construction and road regulations are followed, the inconvenience to the public will be kept to a minimum. The issue of increased truck traffic was not brought up during the public hearing except during one comment read by a representative from Senator Welborn's office. The senator suggested using on-site materials as much as possible to reduce the amount of materials that would be trucked in. EPA agrees that on-site materials may be used for fill and grading, thereby reducing truck traffic. See comment and response 1.6 above.

3.B.8. Please refer to response to comment #2.11.D.i. and v.

3.B.9. Please refer to response to comment 2.11.D.i-vi and 2.11.E.iv regarding the landfill cap. Also, the risk assessment is considered a baseline condition at the site and this assessment indicates that the amounts of contamination in the groundwater are at unacceptable levels. The No Action alternative was carried through into the Proposed Plan and, as stated in numerous responses above, was not selected because, as the risk assessment indicates, it does not achieve ARARs or protect human health and the environment. The Act 641 cap, as stated in responses 3.5 and 3.6 above, does not achieve ARARs and therefore was not analyzed in depth within the FS. Capping alternatives and groundwater alternatives are interrelated to some degree. An ARAR-compliant cap can reduce leachate generation to help reduce/eliminate contaminants from reaching the groundwater in the future. Groundwater alternatives reduce/eliminate contaminants that are already in the groundwater. Both activities, capping and groundwater remediation, have their own ARARs. At a minimum, the landfill cap, as stated above, must comply with MI Act 64, and the groundwater remediation must comply with MI Act 307, among other ARARs.

3.B.10. Please refer to above responses regarding landfill caps and ARARs.

3.B.11. This comment did not indicate what inconsistencies existed between the RI/Risk Assessment and the FS with regard to the exposure to landfill contaminants. The "Summary of Risks" tables within the FS, extracted whole from the RI/Risk Assessment, and other summaries within the FS adequately reflect what was presented within the RI/Risk Assessment. EPA does not believe that redundant safety factors are being applied by the selected remedy. The goal of this remedial action is to protect human health, welfare, and the environment, and each component of the selected remedy contributes independently toward this goal. Some of the alternatives selected may complement each other, such as the relationship between the capping of the site and the groundwater pump and treat (the better the cap, the less time may be needed to clean the aquifer, since contaminants will not leach from the landfill to the groundwater), but there are no redundancies in the selected remedy.

C. Summary of Comments:

3.C.1. Issues addressed within this comment have been addressed in the responses to other comments above. Enhanced bioremediation was re-evaluated by the EPA and was selected as the primary groundwater remedy.

3.C.2. This comment is addressed in numerous responses within comments #1, 2, and 3 above.

3.C.3. The No Action alternative was carried through the FS and in the Proposed Plan. It did not meet ARARs, nor was it protective of human health and the environment. The risks posed by no action are reflected in the baseline risk assessment.

3.C.4. EPA feels that there is sufficient data in which to base a decision on remedial action selection for the West KL Avenue Landfill site. The MDNR has concurred with the selected remedies, as stated within the ROD. If any significant changes occur to the selected remedies, as a result of the Remedial Design, the public will have the opportunity to review and comment on such changes. Also, public participation and information opportunities will continue through the remedial design and the remedial action.

The report "Review of USEPA Proposed Alternatives and Proposal of Additional NCP Compliant Remedial Alternatives for Implementation at the West KL Avenue Landfill" and the affidavits from Mr. Woolf and Mr. Balkema, that were attached to Steering Committee/GBM letters, were not responded to under individual comments/responses. The points brought forth by these documents were highlighted within either the Steering Committee letter or the letter from GBM. All the above referenced documents have been added to the Administrative Record for this site.

Comment #4:

4.1. I am here to assure you that no one is drinking contaminated water from the landfill and my Department will see to it that safe drinking water continues to be available in the area.

4.2. After contamination was discovered in several wells, the County of Kalamazoo, along with the Charter Township of Oshtemo, took prompt action to restore the water quality. First, deep wells were drilled. Second, a waterline was extended to service the area.

4.3. Since 1981, my Department has taken annual samples from discontinued shallow wells. Lab analysis reveals that concentrations of all the compounds are decreasing, typically by more than 90% over the 9 year period the Department has taken samples.

4.4. My Department believes that the availability of a public water supply will result in all future development connecting to this supply. In the remote chance a resident chooses to have a well, he or she must demonstrate to our satisfaction that a safe drinking water supply is available prior to issuance of a permit.

4.5. The Michigan Public Health Code requires that the well location and construction be designed to protect against pollution and to exclude all known sources of pollution from entering the well. Our Department has developed a decision tree to evaluate applications for well permits within one half mile of a source of pollution.

4.6. Applications for well permits within one half mile down gradient of the intersection of 4th Street and West KL Avenue will be required to demonstrate that contamination will not reach the well. This demonstration may entail the drilling of a test well, use of the deep aquifer, and preconditions for issuance of the permit. One precondition will be the requirement to connect to the public water supply if contamination infiltrates the well system. If a public water supply is not available, our Department has the authority under the Michigan Public Health Code to order any party or parties responsible for the contamination to provide an alternative water supply.

4.7. In sum, my Department: 1) has taken annual well samples since 1981 which confirm a substantial improvement in the quality of groundwater, downgradient of the landfill; 2) have verified that wells in present use as drinking water supplies are within limits set by the Federal Safe Drinking Water Act and; 3) has provided for their assurance that residents will not be exposed to contaminated water supplies by the extension of a public water supply line and the Department's requirements for issuance of well permits.

4.8. Accordingly, EPA and MDNR should not base their remedial decision on the remote possibility that residents might be consuming water which exceeds the Federal Safe Drinking Water Act limits. My Department believes that both your organizations should compare such risks to the actual risks of implementing and operating the proposed remedial selection. We note, for example, that a low-cost fence around the waste disposal areas of the landfill would remove foreseeable risks arising from contaminants in the air and soil according to the investigation results. Therefore, the principal focus of the $31 million remedy is to remove risks arising from contaminants in the groundwater. My Department would like each of the remedial alternatives, including limited action alternatives, evaluated to determine when the quality of groundwater leaving the landfill will return to acceptable Federal Safe Drinking Water levels.

4.9. My Department, EPA, and MDNR are responsible for protecting public health. It is important that our organizations accurately convey to the public the risks posed by the landfill. Our Department believes these risks to be extremely minimal.

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Attached to the Comment Letter was the decision tree and the County's results from the April 1990 sampling of the groundwater at and around the landfill.

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Response #4:

4.1. No response to comment needed.

4.2. No response to comment needed.

4.3. Several contaminants found in the groundwater at and around in the landfill exceed levels set by the Federal Safe Drinking Water Act's Maximum Contaminant Levels (MCL) by orders of magnitude. For example, the most recent data available, (the data submitted with this comment, dated May 2, 1990) shows benzene still in the groundwater at levels of up to 750 part per billion. The MCL for benzene in groundwater is 5 part per billion. This indicates that even though some contaminants may have decreased in concentrations in areas of the contaminant plume, there are still several contaminants in the groundwater that exceed federal and state drinking water standards. Also, the RI and the summary report submitted by Wilkens & Wheaton indicate that several groundwater monitoring wells have shown an increase in some contaminants over the years.

4.4. No response to comment needed.

4.5. No response to comment needed.

4.6. The decision tree (Comment 4.5 above) and the permit process are adequate protection for people who follow permit procedures, but it can not be guaranteed that everybody will seek a permit to install a drinking water well, nor does it prevent use of the existing drinking water wells in the area. In addition, the remedial action as selected by the ROD, will assure that the contamination will not spread into areas not previously contaminated, (either horizontally within the shallow aquifer or vertically to the deeper aquifer). Whereas your program will prohibit new wells from being installed and will replace wells that become contaminated, the selected remedy will prevent further wells from becoming contaminated and will accelerate the time that the aquifer may be used as a drinking water source again. Furthermore, the NCP does not allow the use of institutional controls to prohibit exposures to contaminated groundwater.

4.7. EPA agrees that residential wells presently in use are within the limits set by the Federal Safe Drinking Water Act, but the groundwater between these residents and the site has contamination within it that far exceeds acceptable levels. It is the duty of EPA and the MDNR to protect not only human health or welfare, but also the environment.

4.8. The selection of the remedial action at the site is not based solely on the risk factors derived from the Remedial Investigation. The issue of ARARs, (as explained within responses to comments 1, 2, and 3 above) also plays a large part in the selection of the remedial action. Without the installation of a proper landfill cap, there is no way to determine how long the contaminants will continue to leach from the landfill and enter the groundwater. With the RCRA-type cap, the volume of leachate generated will be greatly reduced and, in combination with the groundwater pump and treat, the shallow aquifer should be within federal drinking water standards within a much shorter timeframe than if no or limited action is done at the site. The FS estimated that if the pumping rate of 2,000 gpm was utilized, the aquifer would be cleaned in about 6 years. The G&M Review Report indicated that with a pumping rate of 500 gpm, the aquifer would need about 18 years to be within acceptable levels. The actual cleanup time period will be dependent on the number of wells used to extract the groundwater and the pumping rate of each well. No timeframe has been established in regard to how long it will take for the groundwater to naturally attenuate, since the quantity of waste within the landfill is unknown.

4.9. The MDNR and the EPA are also responsible for protecting the environment and the natural resources of the state. In pursuing our joint goals (protection of human health, welfare and the environment), EPA and the MDNR feel that the selected remedy within the ROD is the appropriate approach to this site.

Comment # 5:

5.1. In 1979, the County closed the West KL Avenue Landfill in accordance with and under the direction of the MDNR. The landfill was covered with approximately 2 feet of soil enhanced by bentonite and a water diversion system to reduce the infiltration of precipitation. Permeability tests of the bentonite treated areas reveal that infiltration was reduced to $2x10^{-8}$. Gas vents were also installed and the landfill was vegetated. Thereafter, the landfill cover was inspected and repaired to maintain the integrity of the cover. Samples were and continue to be taken and analyzed from monitoring wells and neighborhood wells. This closure met the then existing Michigan closure requirements for sanitary landfills.

5.2. It now appears that MDNR is insisting (and EPA is concurring) on closure of the landfill under the more costly hazardous waste regulations. The County believes this decision is erroneous and could result in adding ten to twenty million dollars to the cost of closure without appreciable benefits. This change in direction is not justified, since knowledge about the content of the landfill has not changed since 1979 when the landfill closed under the sanitary landfill regulations. The County believes that the government's contractors erred when it failed to fully evaluate the landfill based on upgrades to meet the Act 641 requirements. The EPA and MDNR should now evaluate and compare the effectiveness and cost of an Act 641 cover to its proposed remedial plan.

5.3. Second, in great detail the EPA and MDNR have evaluated the pathway of potential exposure based on the unremediated conditions at the landfill, but have only evaluated the potential pathways of exposure after implementation of the various remedial alternatives in general terms, such as, the proposed groundwater remedy "provides greater long-term effectiveness and permanence than provided by the no action alternative." Does the word "greater" mean that the preferred groundwater remedy will restore groundwater leaving the site to drinking water standards in 6 years (EPA' figure) as compared, for example, to 9 years for the no action alternative? EPA and MDNR should fairly evaluate and compare each of the remedial alternatives as well as the remedial alternatives based on a 641 cap and on the improving conditions at the landfill.

5.4. Third, information being developed by G&M indicates that the government's contractor has grossly overestimated the rate of groundwater extraction. I understand your comments acknowledging that 2000 gpm is not likely. Our review of the 1979 Closeout Plan for the site further reveals the area of the landfill to be 57.31 acres, not 83 acres as stated by the government's contractor. The rate of extraction and area of the landfill are two of the most important factors in evaluating remedial alternatives and will not affect the remedial alternatives proportionately. We are concerned that these errors may have been a material factor in the government's failure to consider certain remedial alternatives (a settling pond versus reinjection, an Act 641 cover versus an Act 64 cover, etc.) or its selection of the preferred remedial alternative, let alone the cost projections you are using. The EPA and MDNR should re-evaluate all remedial alternatives (including an Act 641 cover) in light of correct data.

5.5. Finally the County has previously expressed its concern over the UV-enhanced oxidation alternative groundwater remedy onsite. Its position has not changed. However, we do wish to add that the proposed groundwater treatment facility is to be located on an unused portion of the landfill. This area has value as a source of fill material for the cover thereby reducing the County's cost of remediation. Since this area will be disturbed, it is preferable that mobilization, decontamination, and location of the groundwater remediation system, if any, be located on the fill areas after taking appropriate precautions. This action will avoid delays and preserve this unused tract for use as cover material and possible future use.

5.6. I understand EPA has given preference to treatment of the groundwater by discharge to the City of Kalamazoo water treatment plant. The County believes at least that is a step in the right direction by EPA.

5.7. The purpose of a public comment period is to solicit responses to the EPA and MDNR proposed remediation plan. While the County may not agree with all the approaches taken by the government, we share in common the mutual objectives to make certain that releases from the landfill will not adversely affect human health and the environment.

Response #5:

5.1. Please refer to responses above (such as response to comment #2.11.E.iv) and the RI report, regarding the status of the current cap.

5.2. The cost of the landfill capping alternative is a factor in the selection process. However, as a threshold, the cap must be protective of human health and the environment and meet ARARs. Alternatives meeting these threshold criteria are then balanced among five factors, one of which is cost-effectiveness. Michigan Act 641 cap, as stated in response to comments above, does not meet the requirements of the closure that is required under the ARAR, MI Act 64. See responses to similar comments above.

5.3. Refer to response to comment #4.8 above as well as other similar responses to comments above regarding landfill closure ARARs.

5.4. EPA's contractor based their cost estimates on a conservative use of the data on hand. Actual prices will of course vary from the estimates (i.e., if in fact the gpm is decreased from E-A's high estimate of 2,000 gpm to G&M's estimate of 500 gpm). The groundwater remedial action alternatives have been re-evaluated, however, and the use of enhanced bioremediation is the groundwater remedial action selected within the ROD (refer to similar comments above and the ROD). The use of a settling pond has never been discounted but awaits the results of the pump test that will be needed during the design of the pump and treat system to determine the actual pumping rate (refer to the Proposed Plan and the ROD). The evaluation of an Act 641 versus an Act 64 landfill cover was not influenced by the actual size of the landfill. As mentioned in above responses to comments, EPA believes, based on historical aerial photos and topographical maps, that the estimate of the landfill size is probably closer to 70-72 acres, and, due to topographical features of the landfill and the need to overlap or feather out the landfill cap over the sides, the amount needed to be capped was conservatively set at 80 acres. Refer to responses to comments above regarding Act 641 versus Act 64 closure.

5.5. Refer to responses to comments above and the ROD regarding the selection of enhanced bioremediation over the POTW or UV/oxidation. The location of the treatment facilities and the extraction wells, as shown within the Proposed Plan and the ROD, are only approximate locations and the final locations can be negotiated at a later date.

5.6. The use of the POTW is no longer the preferred groundwater remedial action, replaced by the use of enhanced bioremediation. Refer to responses above and the ROD.

5.7. EPA believes that its ROD will significantly advance this mutual goal.

Comment #6:

6.1. It is important to understand that the County has a responsibility to its residents to ensure a safe, potable water supply in and about the West KL Avenue Landfill. To this end, the County and the Township of Oshtemo originally drilled deep wells and later extended the water line. Since 1980, the County's Health and Human Services Department has monitored area wells.

6.2. We are aware G&M is recommending a municipal landfill cover, in-situ bioremediation of the groundwater and monitoring. County officials, including officials from the Health and Human Services Dept., have discussed with G&M the facts and circumstances supporting its decision as well as the facts and circumstances supporting EPA's preferred remedial action plan. This is to advise you that the County does support the recommendation of G&M. I have explained below the County's thoughts on this matter and have raised several additional issues important to the residents of the County.

6.3. The County has participated in technical discussions with G&M and is aware that no attempt has been made by the PRP Committee to influence the decision of G&M.

6.4. Unlike other Superfund sites throughout the U.S. and Michigan, the County as a viable owner of the landfill is in a better position to manage and control remediation activities, including those activities necessary to protect human health. The County's Health and Human Services Dept. has monitored wells in the area of the landfill since 1980. The County recognizes that such monitoring would have to continue under the G&M proposed alternative remedy until such time as the water quality returns to acceptable state and federal drinking water standards.

6.5. The County is aware that both the state and federal governments have approved the use of bioremediation at Superfund sites. The EPA has recently announced its bioremediation field initiative on June 27, 1990. The initiative is designed to foster field tests, demonstrations, and evaluations of bioremediation. The EPA has concluded, and G&M has confirmed, that extensive bioremediation is occurring at the site. Independent studies by the Upjohn Co. has demonstrated the feasibility of in-situ bioremediation.

6.6. The County believes in-situ bioremediation can be a complete and final groundwater remedy at the site. The probability and advantages of success far outweigh the disadvantages of failure. In the Mason County Superfund site in Michigan, EPA recently issued a ROD to cap the site while continuing to monitor groundwater conditions to determine the effectiveness of the cap. The State of Michigan concurred in this remedy. Therefore, the state and federal governments have established precedent for the remedial alternative recommended by G&M.

6.7. In the remote event bioremediation does not achieve the appropriate clean up levels, I understand the law gives the federal government the authority to require further remediation. This obligation of the government to review the site every five years, combined with the commitment of the Health and Human Services Dept. to monitor the quality of the drinking water ensures the health and safety of our residents.

6.8. The potential savings to the residents and area business community of the G&M recommended alternative are enormous. First, the cost of the EPA alternatives is between $16 million and $20 million greater than the remedial alternatives proposed by G&M. In the unlikely event it becomes necessary to implement a groundwater extraction program, we do not expect to see a substantial increase in these costs. In fact, it may result that further monitoring and reduction of the leachate caused by the new cap could result in reduced future costs if further groundwater remediation becomes necessary. Furthermore, the EPA proposed groundwater remedy is likely to require obtaining off-site access for construction of the extraction system. This could add substantial delays to the time of remediation. In light of the above, the County believes it prudent to defer any decision on implementation of the EPA's proposed groundwater remedy until such time, if any, that the in-situ bioremediation fails to achieve its objectives.

6.9. Second, the EPA's proposed remedy does not have broad community support. In particular, the proposed soil remedy is likely to cause substantial disruption to the area residents. The County estimates that it may take approximately three years to deliver 30,000 truckloads of materials to the site to meet the cover design requirements. The County believes that such activity in and about the site would result in a substantial number of complaints from area residents concerned over safety, dust and deteriorating road conditions resulting from such activity. The proposed soil remedy of G&M reduces that cap requirements to less than half that proposed by EPA, allows use of the existing cap material and permits the use of on-site and adjoining site borrow material for construction of the cover. This would substantially reduce road traffic and thereby lessen the concern of area residents.

6.10. The County does share your goal to protect human health and the environment. It has demonstrated this commitment by the proactive response to restore potable water supplies and to close the landfill. The County looks forward to continuing its good working relationship with both the state and federal governments.

Response #6:

6.1. EPA understands the County's commitment and commends the County on its efforts to provide a safe, potable water supply to residents near the West KL Avenue Landfill site. The County's monitoring has verified that the groundwater in and around the site is still contaminated above the federal and state acceptable limits.

6.2. Please refer to responses to comments #2 and #3 above.

6.3. No response to comment needed.

6.4. This situation, in which a municipality is owner of the site, is not uncommon within Superfund. The advantages of a municipality handling the remedial activities, including the operation and maintenance, are well known.

6.5. Enhanced bioremediation is now the selected groundwater remedial action. Please refer to responses to comments above regarding in-situ and enhanced bioremediation. Also, refer to the ROD in regard to the selected remedy.

6.6. See responses to comments #2 and #3 above regarding the use of in-situ bioremediation. In regard to the Mason County Superfund Site, the EPA and the state did agree on capping the site first, then to conduct a groundwater remedy some time later if groundwater data indicated conditions were not improving. Substantial differences exist between the two sites. In particular, the contamination area at the Mason County site is much smaller than at West KL, and the contaminants at Mason County are found in concentrations much lower than at West KL. For instance, 1990 data from the Kalamazoo County Health Department shows benzene still found at levels up to 750 ppb, while at Mason County, benzene was found at levels of only up to 11 ppb. Other contaminants are similar in that they were found in concentrations which are magnitudes lower at Mason County than at West KL. Only benzene (MCL 5 ppb, found at 11 ppb) and 1,1-dichloroethene (MCL 7 ppb, found at 59 ppb in one sampling round) exceeded the federal drinking water standards at Mason County, while at West KL benzene (MCL 5 ppb, found at 720 ppb), 1,2-dichloroethane (MCL 5 ppb, found at 200 ppb), and vinyl chloride (MCL 2 ppb, found at 107 ppb) were the compounds that exceeded the federal drinking water standards. Also, West KL has more groundwater data available, so the presence of the contaminants is considered a fact, while at the Mason County site, only limited groundwater data was available, so continued groundwater monitoring was needed to verify the extent and level of the contamination. At Mason County Landfill, in short, the cap is being installed while the groundwater is being investigated further. The situation at the West KL site is much more serious than the situation at the Mason County site. Also, as a matter of record, Mason County is presently installing an Act 64 compliant cap.

6.7. EPA has the obligation to review remedies at site's in which hazardous wastes/substances remain on-site whenever warranted, but at least within 5 years. If the selected remedy does not achieve the cleanup goals as stated within the ROD, EPA will require appropriate measures to be taken to assure protection of human health or welfare, and the environment.

6.8. As discussed above, the NCP provides nine criteria to evaluate alternatives, categorized into three groups. 40 CFR 300.430(f). Cost factors are balanced against four other criteria in the second category. Consequently, cost savings is not the major objective in the selection of the most appropriate remedial action for a site. Cost-effectiveness is one of the balancing criteria when comparing alternatives against each other. Therefore, the use of enhanced bioremediation was re-evaluated and chosen as the groundwater remedial action alternative because of cost-effectiveness. The estimated cost of the total remedial action at the site is now approximately $16.5 million compared to the $23.5 to $27 million as estimated in the EPA's Proposed Plan. The purchase or lease of off-site property most likely cannot be avoided since contamination from the site does not stop at the landfill's borders and groundwater off-site will need to be extracted for treatment.

6.9. As mentioned in responses above, the disruption to the local residents will be unfortunate and will be kept to a minimum through the use of proper hauling and construction methods. The caps proposed by G&H do not achieve ARARs and, in effect, will not (at least for the proposed cap using on-site soils or the repairing of the existing cap) be much different from the cap that was applied in 1980 and has failed to prevent groundwater contamination.

6.10. EPA also looks forward to all parties cooperating in this important environmental matter.

Comment #7.

7.1. It is my understanding that the EPA's Preferred Remedial Action Plan calls for the construction of a proposed RCRA cap. To construct this cap, approximately 900,000 cubic yards of materials are required to place the five and one-half foot cap over the existing cap at the landfill.

7.2. Assuming a truck can transport 30 cubic yards per load to the site, this would involve over 30,000 loads of material taken to the site. Furthermore, it would take over three years just to bring materials to the site. This heavy volume necessarily means greater traffic in and around the site and a corresponding increase in the risk of accidents, injuries and fatalities. In addition, this traffic flow will increase noise, pollution and road wear and tear at greater expenses to the local taxpayers, let alone the disruption to the neighborhood throughout the roadway area to be utilized. What's more, as I recall, KL Avenue is an all-weather road only up to the site going west.

7.3. Given the forementioned facts, I believe the EPA should consider the following:

A) I believe it is important that the EPA incorporate, to the maximum extent possible, the use of on-site and local materials to fulfill any capping requirements. Furthermore, the EPA should consider other capping alternatives and scenarios which require that less material be brought to the site. For example, use of bentonite, utilization of the existing cap material or selection of a solid waste cap.

B) Next, that the EPA re-evaluate carefully its selection of soil and groundwater remedies and the risk implementation these remedies pose to the public at large. For example, the selection of a solid waste cap as opposed to a 641 cap results in the need to obtain far less cap material, thereby substantially reducing the risks associated with traffic accidents without appreciable increase in the hypothetical risks associated with drinking contaminated groundwater.

C) Finally, that the Township of Oshtemo and the County Road Commission regulate the volume and weights of the various trucks and other utility vehicles traveling on local roads to and from the site to avoid, to the maximum extent possible, the impact on roads due to movement of heavy construction vehicles.

Response #7:

7.1. EPA's ROD requires the design and installation of a RCRA cap. The details of this cap are summarized within the ROD and detailed in the FS.

7.2. In order to adequately cover the site, meet ARARs and protect the integrity of the landfill cap to reduce leachate to the groundwater, the ROD has selected the RCRA-type cap. As mentioned in responses to the above comments, it is an unavoidable and unfortunate inconvenience for the neighboring residents. On-site materials should be used to the maximum extent practicable, but not at the sacrifice of a lesser quality cap than is called for by the ARARs. This would substantially reduce the amount of materials required to be transported to the site. Following proper hauling and construction methods will help to minimize the risks caused by the capping to the neighboring residents. In regard to the wear and tear on the roadways, this is a problem that must be solved outside of U.S. Government involvement. The construction contractors should be required to repair any damage caused to roadways because of the Remedial Action.

7.3.A. On-site and local soils can and should be used to the maximum extent practicable. The requirements of the RCRA-type cap must, however, be met (i.e. meet the clay thickness and compaction of MI Act 64). On-site materials can possibly be used for the grading, fill material, and topsoil layers. See responses to comments above regarding alternative capping methods.

B. The groundwater remedy has been re-evaluated, see above response to comments and the ROD. Also see above response to comments regarding alternative capping methods.

C. This is a local concern that must be addressed by the appropriate local officials.

Comment #8:

8.1. When the landfill was closed in May 1979, the MDNR prepared a closure plan pursuant to State law, rules, and regulations. The County of Kalamazoo, with assistance from the Charter Township of Oshtemo, complied with MDNR's directive and completed the closure plan in 1980 which along with other costs the County incurred totaled, at present dollars, $1.5 million.

8.2. Ten years later EPA and MDNR have now proposed another closure plan that will cost $20 - $30 million. Municipalities, including the County of Kalamazoo, do not have unlimited financial resources to continue to finance new closure plans every ten years for the same landfill site. What assurances can you give that the Proposed Plan will be successful, or that another closure plan will not be required in ten years or at some other time in the future?

8.3. I would also like to request that EPA and MDNR strongly consider the comments and recommendations that will soon be submitted by G&M since they are much more cost effective, yet environmentally sound, for this landfill site than the Proposed Plan.

Response #8:

8.1. Due to the contamination present in the groundwater, it is apparent that the present landfill cap has failed. The Michigan regulations for the proper closure of sites that have accepted hazardous wastes are cited in Michigan Act 64. The selected alternative for landfill closure is a RCRA-type cap that is equal or better in performance than the MI Act 64 closure. See the ROD and FS for details on the capping materials.

8.2. The County alone does not have to finance the closure. Other Potentially Responsible Parties (PRPs) [PRPs include waste generators and transporters, and site owners and operators] will be involved in the financing of the remedy as well as the County. EPA believes that the cap will have a useful life of at least 30 years, and more if properly maintained.

8.3. See above responses to comments and the ROD regarding re-evaluation of the groundwater remedy.

Comment #9:

9.1. I question the need for and appropriateness of this proposed remedy (landfill cap) in view of the fact that approximately 20 acres of the site were capped in 1980 under then prevailing MDNR regulations. The proposed plan assumes that the entire 87 acre site needs to be capped, which is not consistent with records and site maps which indicate that only 60 acres was ever used for disposal or waste.

9.2. The proposed plan fails to take into account the true magnitude of such a capping project, both on an economic and practical level. A 60 acre cap consisting of 2 feet/of compacted clay and 6 inches of topsoil would require in excess of 360,000 truck yards of clay to net 240,000 cubic yards of compacted material. This figure includes a "best case" shrinkage of 33% from loose clay to compaction. The closest permitted clay borrow material is in Watson Township in Allegan County 22 miles from the site.

9.3. My experience (in the excavation business for over 40 years) has been that under the best conditions on 40 yard gravel truck with a pup trailer, or "gravel train" will yield 26.5 cubic yards of compacted clay and such gravel train could only complete one trip site to site in just under 2 hours, or at best 6 trips in a 10 hour day.

9.4. Under the most favorable weather conditions capping operations can only be performed for the 7 month period between mid-April and mid-November, as all available ingress and egress roads are subject to weight restrictions and frost laws by local authorities and the State of Michigan. All of this translates to over 9,000 truck trips into and out of the site just to complete the clay portion of a 60 acre cap. Given real world equipment, labor and weather problems it will take a minimum of 2 to 3 years of constant heavy traffic to complete a 60 yard cap. If you use the same calculations for your proposed remedy and acreage, you must increase the number of loads and time required by at least 30%.

9.5. For the above reasons, the EPA should re-evaluate and revise the proposed remedy as to landfill capping, taking into account 1) the capping which has already been performed, 2) the actual additional acreage which may need to be capped, and 3) the type of cap which may be needed. The marginal and questionable benefits of your proposed plan must be compared to the very real risks which its implementation will create, including but not limited to, traffic, air pollution, road damage, danger to the public and disruption of the community.

Response #9:

9.1. See above responses to comments regarding failure of the present cap and regarding the controversy over the acreage of the site.

9.2. See responses to similar comments above.

9.3. No response to comment needed.

9.4. No response to comment needed.

9.5. See above responses to similar comments.

Comment #10:

10.1. In behalf of the County, I'd like to again call your attention to the Mason County Landfill ROD and Responsiveness Summary. The EPA and the MDNR proposed a landfill cover remedy and deferred all action on the groundwater remedy pending a determination of the covers effectiveness.

A) "In addition, the effectiveness of the soil/clay cap of alternative 4 must be measured before resources are expended on a pump and treat system."

B) "Testing indicates that the soil/clay cap will reduce the leachate generation within the landfill as much as ninety percent. This will in turn decrease the amount of contamination reaching the groundwater and therefore, in the future, contaminants in the groundwater may be dilute enough to fall below federal drinking water standards and acceptable risk levels."

10.2. The principal difference between Mason and West KL Avenue Landfills is that in the latter instance sufficient groundwater data exists to hypothecate the effectiveness of a cap on the quality of groundwater and EPA, G&M and Upjohn have substantiated the presence of naturally occurring bioremediation of the groundwater. Thus, sufficient information exists for EPA and MDNR to select in-situ bioremediation as the groundwater remedy.

Response #10:

10.1. Please refer to response to Comment #6.6 above regarding the comparison of this site to the Mason County Landfill.

10.2. Please see response to Comment #6.6 above regarding the comparison of this site to the Mason County Landfill.

Comment #11:

11.1. This letter is offered in support of comments by W. Freeland, Kalamazoo County Administrator, in his letter to you of 8/10/90. Oshtemo Township, like the County, is a PRP at the site and also has certain responsibilities to Township residents and the public. The Township shares the goals of the County, EPA and the MDNR to protect human health and the environment.

11.2. Township officials are familiar with the facts and circumstances of this site, including the G&M study and recommendations and the EPA's preferred remedial action plan. This will confirm on behalf of the Township, that of the proposals for further capping of the site, the Township supports the G&M recommendation of a municipal landfill cover. Of the proposals for groundwater treatment, the Township supports the G&M recommendation for in-situ bioremediation and monitoring. The reasons set forth in Mr. Freeland's letter in support of the preference for these alternatives are adopted by the Township.

11.3. The Township also joins in the concerns expressed over the volume of truck traffic which would be generated by EPA's proposed capping remedy. We believe the EPA's proposed remedy does not have broad community support. A number of Township residents have expressed justifiable concerns about the danger, noise, inconvenience, and destruction of roads which would result from construction of EPA's proposed landfill cap, and we join in those concerns. Construction of the landfill cap recommended by G&M would require substantially less truck traffic and would therefore substantially lessen the danger and inconvenience of the proposed remedy, with substantially less expense and with effectiveness equal to the remedy proposed by the EPA.

Response #11:

11.1. No response to comment needed.

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11.2. See above response to G&M comment (Comment #3) regarding landfill caps. Also, see above responses and the ROD regarding the re-evaluation and selection of enhanced bioremediation as the groundwater remedy.

11.3. See above responses to similar concerns.

<u>Comments from Residents:</u>

Comment #12:

12.1. As stated at the meeting we identified ourselves as being the owners of forty acres immediately bordering the east of the site.

12.2. The proposed landfill cap will increase the height of the landfill by 5-feet, 6-inches.

12.3. I stated my concern about this because nothing was mentioned about prevention of water runoff onto my property, into my 2 wildlife ponds and/or into Bonnie Castle Lake, of which we own considerable frontage. I mentioned that the current berms are in poor condition and that much improvement would have to be made to prevent any runoff. It was also mentioned at this meeting that Kalamazoo County has already capped the site per your previous specifications. It was also stated that to again cap this area per your proposal it would take 60,000 truck loads of fill. This I feel would ruin KL Avenue, requiring much repair to be made to the road. Are you willing to pay for all this fill and necessary repairs to KL Avenue? We people on KL Avenue do not look forward to this additional nuisance traffic.

12.4. Installing pumps at the site to pump and treat the contamination may involve as many as 7 pumping wells. If this many pumps are required, we feel it will not only dry up our current well water supply, but will also affect the water levels in our two wildlife ponds and Bonnie Castle Lake.

12.5. It was also mentioned that after on site treatment of the contaminated water, that the treated water could be discharged into Bonnie Castle Lake. Nobody from your departments ever discussed this with the current property owners of Bonnie Castle Lake, of which that are only about 7 owners. I, at this time would be opposed to this method of pumping, treatment, and discharge.

12.6. It was mentioned that a sanitary sewer line be constructed to carry the contaminated fluids to the Kalamazoo Treatment Plant. Again, I ask, who is going to pay for this sewer line?

12.7. A water line was constructed along KL Avenue and 4th Street by Oshtemo Township because of some polluted water wells on the westerly side of the site.

12.8. If any water wells of property owners with frontage along this water line should go bad because of claimed pollution, they are required to pay front foot cost of the water line plus hook up connection fees to obtain city water. I claim this is not fair to the KL Avenue property owners. We did not pollute the site, the whole of Kalamazoo and adjoining counties caused the claimed pollution. All should have paid for the installation of the water line. I agree those who connect to the water line should pay the hook up connection fee, but not the front footage cost; whether it be water line or sewer line.

12.9. A statement was read at this meeting from the Kalamazoo County Health Dept. that monitoring of test wells placed around the site showed a measured drop of pollution to the groundwater in the shallow aquifer.

12.10. It has been 10 years that the site has been closed. The County and Township have met all previous requirements pertaining to the site. I believe your cost estimate of $25 million for the site is totally out of line and absolutely unnecessary.

Response #12:

12.1. No response to comment needed.

12.2. No response to comment needed.

12.3. The design of the landfill cover will take into account site specific issues such as surface water runoff, addressed by your comment. Also, see above responses to comments regarding the need to cap the site, the ARARs and the issues regarding the inconvenience to the neighboring residents. As mentioned in above responses, the PRPs will be sought to finance the remedial action at this site.

12.4. There should not be any effect on your well by the pumping action that will occur west of the site. During the actual design of the groundwater extraction/re-injection system, issues such as yours will be addressed.

12.5. Bonnie Castle Lake was dismissed as a discharge point very early in the decision process, so no discussion with the residents was deemed needed.

12.6. The use of the Kalamazoo Publically Owned Treatment Plant (POTW) is still a viable option. All costs would be picked up by the PRPs.

12.7. No response to comment needed.

12.8. This is not an EPA issue but should be addressed to the County and/or the Township. You may wish to consult the County or your attorney regarding this issue.

12.9. See responses to similar comments above.

12.10. Please refer to the RI Report, the ROD and the responses to comments as to the need for remedial action at this site.

Comment #13:

13.1. As home and property owners located adjacent to the site, we are concerned for the future cleanup plans of the landfill site.

13.2. We understand the need to cleanup the area, and to take action to prevent further damage by the landfill to the surrounding area but question the methods planned by the EPA and the amount of taxpayers' money to be used for these methods. The plans outlined at a recent township meeting seemed excessive for the problems listed. We would hope that federal officials would plan to spend tax dollars wisely while accomplishing what is necessary to cleanup the area.

13.3. We are also concerned with the fate of Bonnie Castle Lake. Since we moved to the area, we have worked continuously to clean up our shoreline and have made a conscious effort to remove debris from the lake. It is our sincere wish that any "clean up" action taken by the MDNR or the EPA will not adversely effect the area surrounding or the level and quality of water in Bonnie Castle Lake.

Response #13:

13.1. No response to comment needed.

13.2. The costs will be distributed among all the PRPs (generators and transporters of hazardous wastes and substances to the site and the owners and operators of the site) in a manner to be set. At present, there are over 65 PRPs which are to share these remedial action costs.

13.3. The remedial actions planned will not effect Bonnie Castle Lake. No groundwater treatment discharge will enter Bonnie Castle and the new landfill cap will be designed to deflect excess surface water drainage away from Bonnie Castle Lake. The groundwater extraction system will be located to the west of the site and will be designed not to effect the relationship between the lake and the groundwater.

Comment #14:

14.1. I would like to go on record of opposing any action being taken on the so called clean up of the KL Ave. Landfill in Kalamazoo for the following, among many, reasons: I question the degree of contamination and degree of hazard to one's health as reported at the meeting of July 23, 1990. As in most accusations of contamination and hazards to health the information is very sketchy, and the facts practically nonexistent. Lab tests on rats and mice are inconclusive as in past cancer scares about cranberries, red dyes, etc. They only proved, if anything, that these substances would have to be consumed or ingested in monumental quantities to pose a risk to one's health.

14.2. The landfill has been closed for 10 years and capped according to the DNR and EPA requirements at the time, and fully approved. In the 10 years the "contamination" level has decreased 90% according to concerned agencies, which to me does not warrant the spending of millions of dollars on this land for something unknown and untested.

14.3. At this time, to my knowledge, no one needs to be concerned about drinking contaminated water caused by the landfill. New city water lines have been and are being made available to the entire area, along with deeper wells which have replaced the shallow ones in question.

14.4. There has been talk of bringing suit against companies who used the landfill, which covers Kalamazoo County and surrounding areas, which I feel is grossly unfair. I suspect the innocent companies who discarded nothing harmful would be paying for a few who dumped what you consider hazardous materials. The questionable materials were discarded by a minor few out of the tons and tons of many.

14.5. I do not believe in health hazard hysteria. Germs have been, and always will be here with us. I do believe in the purpose and intent of the DNR and EPA, but do not consider the expenditure of millions of dollars to clean up 87 acres and groundwater on a small tract of land in Kalamazoo County to be warranted. I believe the situation will be better and lessen, as is already happening, as time goes on. I feel the emphasis on clean up should be placed at each source producing questionable materials as it is occurring, and use the concentration of dollars for that purpose, and more clean up of the Great Lakes, our rivers and streams.

Response #14:

14.1. No response to comment needed.

14.2. Your concern is legitimate but the contamination at and around the site is real, as shown by the groundwater samples by the EPA and by the County. Even though some contaminants have decreased in concentration over the years, the concentration of several contaminants still exceed acceptable drinking water levels and remedial action must be taken. See responses to similar comments above.

14.3. See responses to similar comments above.

14.4. The EPA has done extensive searches to find out who disposed of hazardous wastes/substances in the landfill. Since the landfill closed in 1979, records are scarce. According to federal law, any generator or transporter of hazardous wastes/substances and the owners/operators of the site can be held liable for any investigation and cleanup of contamination at a site. Those who generated or transported only wastes which did not contain hazardous wastes/substances would not be liable for such costs. In the eyes of the law, those who disposed of minor amounts, can be just as liable as those who disposed of major amounts. You may refer to Section 107 of the Comprehensive Environmental Response, Compensation, and Liability Act, as amended by the Superfund Amendments and Reauthorization Act of 1986 (better known as Superfund) for the legal specifics regarding liabilities at Superfund sites.

2

14.5. Refer to response 14.2 above.

Comment #15:

15.1. Although we are east of the landfill and in less danger of soil and water contamination, we are concerned about Bonnie Castle Lake and what affects your proposed plan for cleanup would have on the lake. What assurances do we have that the groundwater you propose to pump from the landfill into Bonnie Castle Lake won't still contain pollutants.

15.2. We feel opening up the landfill with heavy equipment would be like opening up a "can of worms". We feel this could do more harm than good.

15.3. As for putting on another cap of clay, liners, and soil, we feel that this is not necessary as contamination has decreased in the 9 years since the dump's closing. I'm sure you can imagine what hauling 60,000 loads of clay, soil, etc. over a period of 5 years would do to KL Ave.

15.4. My parents lived here during the 10 years the landfill was open. This was supposedly their "Golden Years" but it was emotionally draining to them to have the garbage trucks going by at 1/2 to 1 hour intervals. Now we live here in our "Golden Years" and face the same possibility.

15.5. We will be the ones to pay for the increased stress to the roadway through special assessments for road repairs. The same would be true if the so called polluted groundwater were to be pumped to the city sewage treatment plant. We would be assessed for sewer lines that we don't need. We have a good septic tank and dry well that should last us for our remaining years.

15.6. We also feel it would be unfair to residents west of the landfill to have deed restrictions put on their property.

15.7. If according to your figures something must be done, then we feel installing a low cost fence around the site would be sufficient at this time.

Response #15:

15.1. No water will be discharged to Bonnie Castle Lake. See responses to similar comments above.

15.2. The landfill will not need to be "opened." The landfill cap will be installed on the present cap. Some of the present cap material may need to be regraded, but the waste material does not need to be disturbed.

15.3. See responses above to similar comments.

15.4. The disturbance caused by the installation of the new cap is unfortunate and cannot be avoided. As stated above, if proper hauling and construction methods are followed, the disturbances should be kept to a minimum. The capping activity is estimated to take 3-5 years.

1.3

15.5. It will be the County's and Township's responsibility to address repairs to the roads. The City sewage treatment plant is no longer the preferred groundwater alternative but if the City's sewage treatment plant is used as part of the groundwater remedial action, the PRPs would need to pay for the sewer extension to the landfill and residents will most likely be charged only if they elect to hook-up to the system. Residents normally are only be charged for the hook-up from the home to the street, but this is a County or Township matter.

15.6. Deed restrictions are necessary as additional protection to the residents' health. We can not permit new wells or existing wells to receive groundwater that is contaminated beyond federal limits.

15.7. The fence will be used but the groundwater remedy is needed to actively address the groundwater contamination and meet ARARs. The upgraded cap is needed to meet ARARs and to prevent further contamination of the groundwater.

Comment #16:

16.1. The Oshtemo Lakes Association is composed of residents along Bonnie Castle and Dustin Lakes in Oshtemo Township, as well as those nearest the KL Avenue Landfill in Kalamazoo County. It was largely through the efforts of our organization that the KL Avenue Landfill was 1) prevented from expanding to 600 acres, as had originally been planned by the County; and 2) was subsequently shut down entirely. Accordingly, we have interests that run fully parallel to the concerns of EPA and we thank you for your efforts thus far.

16.2. We do, however, have serious qualms about some of the procedures you have proposed as a remedy. We are primarily concerned about any "heroic" measures that could negatively impinge on our water supply, such as an attempted purging of the aquifers below the landfill. With massive quantities of water pumped back to Kalamazoo treatment plants, wouldn't the water table of the area in general, and Bonnie Castle Lake in particular, be affected? Similarly, has ultraviolet treatment of contaminants been demonstrated as an effective mode at other landfill sites, and would there be sufficient protection against air pollution?

16.3. In view of the fresh water pipeline to people with affected wells and the diminishing pollution plume, one wonders if the multi-million-dollar measures you propose are really appropriate now. In this respect, we join the County in suggesting that a less ambitious and far less costly a remedy be devised.

16.4. At the same time, we must alert both EPA and the County that not everyone in the affected area benefits from the new water supply line along KL Ave. My well, for example, is the closest to the "KT Garbage" section of the site and yet it is monitored only twice a year, while 8260 West Main Street, also in the immediate area of the site, is not monitored at all. We also wonder why no monitoring wells were ever drilled at the north-northeastern edge of the landfill, which is our vector away from the site.

16.5. Other low-cost and immediate improvements necessary at the landfill would be to erect a fence around the perimeter. At present, motorized "dirt bikes" in summer and snowmobiles in the winter are tearing up the groundcover.

Response #16:

16.1. No response to comment needed.

16.2. The extraction of the groundwater should not affect Bonnie Castle Lake since the lake is divided by a layer of clay from the groundwater body that will be pumped. See the RI report for more details on the geological setting of the lake as compared to the site. The design of the groundwater extraction system will be set so that Bonnie Castle Lake will not be affected. UV-oxidation is no longer a preferred groundwater remedial action. The use of enhanced bioremediation is now the selected groundwater remedial action. The use of the City sewage treatment plant may be used if the enhanced bioremediation fails. No matter what system is chosen, air pollution will be monitored and addressed appropriately.

16.3. The estimate of the overall remedial action is now $16 million compared to the $23 - 27 million initially proposed. EPA and MDNR feel the actions selected are needed to assure the protection of human health, welfare, and the environment.

16.4. As the RI Report indicates, the groundwater flow direction in the West KL Ave. Landfill area is to the west with components to the southwest and the northwest. Your well, located to the immediate northeast of the site, was sampled twice during the RI and did not indicate any contamination from the landfill. The RI did not sample all the residential wells in the area, only representative wells that had a possibility of showing contamination and appropriate background wells. The residential well located at 8269 W. Main Street was not sampled during the RI because it is further upgradient than your well and another background sample was not necessary (two background or upgradient wells were installed east of the site). Groundwater monitoring wells were not installed to the northeast of the landfill because your well was a sampling point, and since this location is considered an upgradient point, another upgradient or background well was not deemed necessary in addition to the background wells located just east of the site.

16.5. A fence will also need to be installed to protect the investment of the new upgraded landfill cap as called for in the ROD.

<u>Comments Received Only at the July 23, 1990 Public Hearing:</u>

Comment # 17:

17.1. I am a legislative assistant with the Michigan Township Association, an association of more than 1,200 townships in the State of Michigan. I have come here tonight to express the concerns of our memberships regarding two issues which have emerged because of government action at the West KL Avenue landfill in Kalamazoo.

17.2. First, it is my understanding that this landfill ceased operations in 1979 and undertook a closure of the facility pursuant to and with full approval of the MDNR. It consists of a cap, gas venting, and water diversion system. I further understand since that time conditions about the landfill have substantially improved and that improvement is probably due, in principal part, to the remediation to close the landfill. It is my further understanding that the Township of Oshtemo and the County of Kalamazoo have extended public water supply lines to those parties on private wells in and about the area of the landfill.

17.3. Our association is particularly concerned with the wavering approach taken by the MDNR and the EPA in remediation of the site. Local governments need the assurance that actions they take pursuant to the direction of the MDNR and EPA have a reasonable degree of finality, particularly in situations like the West KL Landfill, where conditions are improving and the local governments have taken steps to minimize the risk to its residents while conditions continue to improve.

17.4. Local governments are not profit centers. When they agree to own and operate a landfill, they do so for the benefit of the entire community and without a profit incentive. Local governments need to be able to estimate the cost that they will incur in closing such facilities; and once closed, need reasonable assurance that it will not be necessary to pay substantial sums to upgrade the facilities already closed.

17.5. Second, according to the records of the MDNR, the site is composed of minimum amounts of industrial waste. Our association is also concerned with EPA's and MDNR's application of hazardous waste remedial requirements to sites that contain principally municipal wastes. The MDNR complies with the State Superfund list comprising over 2,600 sites in Michigan. The EPA has identified over 75 Superfund sites in Michigan. However, neither organization appears to have clearly articulated the conditions under which solid waste versus hazardous waste clean-up standards will apply.

17.6. The application of hazardous waste clean-up standards to sites substantially increase the cost of remediation. In this case, the EPA and the MDNR have estimated a remediation cost to be up to $27 million dollars. A solid waste remediation could be accomplished for under $10 million.

17.7. On behalf of the membership of the Michigan Township Association, I ask that the EPA and the MDNR reconsider their decision at the site in light of the implications resulting from fluctuating remedial positions and the ability of local government to predict and provide the proper costs.

Response #17:

17.1. No response to comment needed.

17.2. See responses to similar comments above regarding the inadequacy of the present cap.

17.3. EPA and MDNR feel that the combination landfill cap and groundwater extraction and treatment will address the contamination problem presently at the West KL site, and if installed and maintained properly, will assure protection well into the future. If, however, new or otherwise unforeseen contamination occurs at the site that is potentially harmful to human health, welfare, or the environment, the EPA and/or the MDNR may require further actions to address these new risks.

17.4. As mentioned in responses to comments above, the County and Township are not expected to finance the entire remedial action themselves. PRPs, as explained above, including waste generators and transporters, and the owners and operators of the site, all are equally liable in funding the remedial action at this site.

17.5. The amount of hazardous substances/wastes disposed of in this landfill have not and can not be estimated based on the data base presently available. The records do show, however, that hazardous wastes/substances as bulk liquids, truckloads of drummed wastes, and tank loads of sludges were disposed of within this site. The EPA and the MDNR feel that this evidence and the concentrations of contaminants found in the groundwater warrant the handling of this site according to hazardous waste clean-up standards.

17.6. See responses to above comments and the ROD regarding the costs of the selected remedial actions for this site. Also see above responses to comments regarding the reasonings for the RCRA-type landfill cap.

17.7. See responses to above comments and the ROD regarding the re-evaluation of the groundwater remedial action and the complete remedial action selected by the EPA.

Comment #18:

18.1. UV-oxidation seems like that is going to be high maintenance. I've only seen it on TV before. It looks like it is very fragile. I don't know if that's been worked into the plan or not, but it seems to me if you treat the groundwater directly beneath the landfill where one would think would be the heaviest contamination, you could pump the treated water back through the landfill treating the soils, which is the source.

18.2. And then on the outer fringes, come up with the nearest absorption or look at another feasibility or another remedial technology on the lighter contaminants instead of just going with one type of remedial design for the whole thing. It seems like to me you're basically looking at a heavily contaminated area. Again, I guess the idea about capping is basically out of sight, out of mind, maybe. I think we're asking for some problems 30 or 40 years down the road.

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Response #18:

18.1 See above responses and the ROD regarding the use of enhanced bioremediation as the selected groundwater remedial action. The use of UV-oxidation, like the other remedial action alternatives presented within the FS, may be implemented to replace or supplement the selected remedy if it is shown that the selected remedy does not achieve the cleanup goals as stated within the ROD. The pumping of the groundwater directly beneath the landfill is a possibility if the groundwater already contaminated outside of the landfill is also collected. The exact locations of the extraction wells for the selected remedial action will be determined during the design of the extraction system. The extraction wells need to be placed in areas that capture or contain the contamination plume, but this may be done in stages with some wells nearer the site and some wells further out. When the wells further out are pumping clean water, they can be shut down leaving the wells nearer the site to continue to intercept the contaminants as the leave the landfill. The idea of pumping the groundwater through the landfill was considered, at least in theory, but was not carried forward because the exact types, quantity, and locations of the hazardous wastes within the landfill are not known. By "flushing" the landfill, you may in fact be creating more contamination than would have been created if the site was left as is, by making wastes or leachate that normally would not have migrated into the groundwater, migrate into the groundwater.

18.2. Refer to 18.1 above regarding the outer fringes of the contamination plume. In regard to potential problems with the site 30 or 40 years down the road, if the landfill cap is properly installed, according to the ROD, and is properly maintained, potential problems down the road will be minimized.

APPENDIX A

LIST OF COMMENTERS DURING THE PUBLIC COMMENT PERIOD FOR THE WEST KL AVENUE LANDFILL FROM JUNE 11 THROUGH AUGUST 10, 1990

COMMENT #	NAME AND AFFILIATION	SOURCE OF COMMENT
COMMENTS FROM STATE LEGISLATURE:		
COMMENT 1:	SENATOR JACK WELBORN	COMMENTS READ AT PUBLIC HEARING, 7/23/90, BY CRAIG STARKWEATHER AND HARD COPY GIVEN TO U.S.EPA
COMMENTS FROM PRPS:		
COMMENT 2:	PRP - KL AVENUE COMMITTEE CONSISTING OF 24 PRPS, LETTER SIGNED BY J.W. WHITLOCK, CHAIRPERSON, STEERING COMMITTEE. AFFIDAVITS FROM MR. WOOLF AND MR. BALKEMA ATTACHED	LETTER
COMMENT 3:	GERAGHTY & MILLER LETTER AND REPORT "REVIEW OF USEPA PROPOSED ALTERNATIVE AND PROPOSAL OF ADDITIONAL NCP COMPLIANT REMEDIAL ALTERNATIVES FOR IMPLEMENTATION AT THE WEST KL AVENUE LANDFILL"	ATTACHMENT TO COMMENT #2
COMMENT 4:	JOHN JADOWSKI, ENVIRONMENTAL HEALTH PROGRAM SUPERVISOR, HUMAN SERVICES DEPARTMENT, COUNTY OF KALAMAZOO, MI	STATEMENT READ AT THE PUBLIC HEARING HELD ON JULY 23, 1990. HARDCOPY OF THE STATEMENT, DECISION TREE AND RECENT COUNTY SAMPLING DATA HAND DELIVERED TO DAN COZZA AT THE HEARING
COMMENT 5:	WESLEY K. FREELAND, COUNTY ADMINISTRATOR, KALAMAZOO COUNTY GOVERNMENT	LETTER, DATED JULY 25, 1990
COMMENT 6:	WESLEY K. FREELAND, COUNTY ADMINISTRATOR, KALAMAZOO COUNTY GOVERNMENT	LETTER, DATED AUGUST 10, 1990

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COMMENT 7:	HERMAN DRENTH, CHAIRMAN, KALAMAZOO COUNTY BOARD OF COMMISSIONERS	LETTER, DATED AUGUST 9, 1990
COMMENT 8:	CHARLOTTE SUMNEY, COUNTY COMMISSIONER, KALAMAZOO COUNTY BOARD OF COMMISSIONERS	LETTER, DATED JULY 27, 1990
COMMENT 9:	JOHN BALKEMA, PRP	LETTER, DATED AUGUST 10, 1990
COMMENT 10:	THOMAS ARMSTRONG, ATTORNEY REPRESENTING KALAMAZOO COUNTY, SHIPMAN AND GOODWIN	FAX, RECEIVED AUGUST 13, 1990
COMMENT 11:	RON FLECKENSTEIN, SUPERVISOR, CHARTER TOWNSHIP OSHTEMO	LETTER, DATED AUGUST 13, 1990

COMMENTS FROM RESIDENTS:

COMMENT 12:	THEODORE SNOW, RESIDENT	LETTER, RECEIVED AUGUST 6, 1990
COMMENT 13:	GAIL L. HEIM, RESIDENT	LETTER, DATED AUGUST, 6, 1990
COMMENT 14:	BETTY J. SNOW, RESIDENT	LETTER
COMMENT 15:	HARL AND JENNIE SNOW, RESIDENTS	LETTER, DATED AUGUST 7, 1990
COMMENT 16:	PAUL L. MAIER, VICE-PRESIDENT, OSHTEMO LAKES ASSOCIATION	LETTER, DATED AUGUST 3, 1990

COMMENTS RECEIVED ONLY AT THE JULY 23, 1990 PUBLIC HEARING:

COMMENT 17:	MS. PAT MCAVOY, LEGISLATIVE ASSISTANT WITH THE MICHIGAN TOWNSHIP ASSOCIATION	STATEMENT MADE AT THE JULY 23, 1990 PUBLIC HEARING
COMMENT 18:	MR. ERIC LARCINESE, RESIDENT	STATEMENT MADE AT THE JULY 23, 1990 PUBLIC HEARING

ADMINISTRATIVE RECORD INDEX

WEST KL AVENUE LANDFILL
KALAMAZOO COUNTY, MICHIGAN

FICHE/FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE
	3	[illegible]	Report on landfill dicussed in three general areas: a) Site operation, b) Site maintenance and c) Site improvement.	C.Richard Norton-Kalamazoo Co.	Board of Public Works	Memorandum
	2	79/04/05	Chronology of site from 10/30/78 to 4/5/79.	Ginny Loselle-MDNR	O.P.Shah-MDNR	Memorandum
	4	79/04/09	Summary and Chronology of the site.	Jim Miller-MDNR	File	Memorandum
	3	79/04/25	Memo decribing media contacts and reiterating the position of the MDNR has taken relative to the KL Ave. Landfill and the corrective actions necessary.	Jim Miller-MDNR	Files	Memorandum
	3	80/02/05	Update of information on the groundwater contamination of private wells.	David Leland-Mich.Dept.PublicHealth	Gordon Oliver-MDPH	Memorandum
	2	80/03/10	Tentative Disposition	James Paskanis-USEPA		Memorandum
	52	84/09/27	Action Memorandum: Authorization to Proceed With a Remedial Investigation and Feasability Study for the K & L Avenue Landfill, Kalamazoo, Michigan (with attachments).	Basil Constantelos-USEPA	Valdas Adamkus-USEPA	Memorandum
	1	86/02/27	Memo stating that the RI/FS will now be Federally funded as an enforcement lead site.	Daggett & Cozza - USEPA	Rush, Gade, et al-USEPA	Memorandum
	1	86/04/16	News Release "EPA To Brief Residents On K&L Avenue Landfill Superfund Site"	Cozza & Ferrecone - USEPA		News Release
	1	86/04/29	News Art. "Plan outlined for cleanup of KL landfill"	Kalamazoo Gazette		Newspaper Article
	1	86/04/29	News Art."Plan outlined for	Kalamazoo Gazette		Newspaper Article

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WEST KL AVENUE LANDFILL
KALAMAZOO COUNTY, MICHIGAN

FICHE/FRAME PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE
		considered Potentially Responsible Parties.			
3	86/08/15	Information Request concerning A-1 Disposal's involvement with the West KL Avenue Landfill, Oshtemo Township, Kalamazoo County, Michigan.	Basil Constantelos-USEPA	Mr.Hoffman-A-1 Disposal	Correspondence
3	86/08/26	Information request concerning UpJohn Company's involvement with the West KL Avenue Landfill.	Basil Constantelos-USEPA	R.Senger-UpJohn Co.	Correspondence
43	87/01/29	USEPA determination that the twenty-nine parties listed on the service list are no longer considered Potentially Responsible Parties.	William Miner-USEPA	See service list	Correspondence
4	87/02/25	Several items that the Steering Committees contractor, Dames & Moore, felt ought to be pointed out for inclusion in the Administrative Record and considered as future decisions about the site are made.	Trienstra-KalamazooCo.Bd. Comm.	Dan Cozza-USEPA	Correspondence
17	87/07/07	Fabri-Kal Corporation's Petition For Removal From PRP List.	Antoinette Beuche-Howard & Howard	Linda Dullea-USEPA	Correspondence
1	87/12/18	Letter to "Concerned Citizen" summarizing results of the Phase I RI and noting that the Phase II RI is available for review at the Public Library.	Concerned Citizen	Daniel J. Cozza - USEPA	Correspondence
2	86/04/25	Michigan Environmental Protection Report	MDNR		Fact Sheet

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FICHE/FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE
			to ten different PRP's.			
	11	85/09/17	Second Request for Information to eleven PRP's.	USEPA	see title	Correspondence
	2	85/10/01	USEPA position that the Test Pit and Geophysical Survey portions of the RI field work are necessary.	William Muno-USEPA	D.Triemstra-Steering Com.	Correspondence
	5	85/10/11	Request to PRP's from USEPA to voluntarily perform the work required to abate any releases or threatened releases of hazrdous substances.	Basil Constantelos-USEPA		Correspondence
	22	85/10/21	Notices to twenty-two PRP's are no longer considered Potentially Responsible Parties.	Basil Constantelos-USEPA	see title	Correspondence
	3	85/12/20	Letter detailing the USEPA's preferance for an Administrative Order by Consent as opposed to a Consent Decree.	Daniel Cozza-USEPA	D.Triemstra-Kalamazoo Co.	Correspondence
	5	86/01/09	Information Request concerning West K.L. Avenue Landfill, Oshtemo Township,Kalamazoo Co., Michigan.	Basil Constantelos-USEPA		Correspondence
	2	86/01/27	PRP contention that the RI/FS should be performed by the Steering Committee.	Duane Triemstra-Steering Com.	Tom Daggett-USEPA	Correspondence
	2	86/04/23	Letter addressing Haviland Products Co. concerns over lack of USEPA response to an earlier letter and a protest to the USEPA's proceeding with an RI/FS.	Charles Denton-Varnum, et al	Thomas Dagget-USEPA	Correspondence
	2	86/05/21	USEPA determination that Haviland Products Co. and Textron, Inc. are no longer	William Kiner-USEPA	see title	Correspondence

ADMINISTRATIVE RECORD INDEX

WEST KL AVENUE LANDFILL
KALAMAZOO COUNTY, MICHIGAN

FICHE/FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE
			effort at the K.L.Ave. Landfill and that they act in a lead role in enforcement actions.			
	4	84/12/04	Letter stating that K.L.Landfill will not be removed from the NPL at this time and sets forth the criteria for de-listing.	Gloria Small Moran-USEPA	D.Holub-Co. of Kalamazoo	Correspondence
	11	85/05/08	USEPA request that recipient voluntarily perform the work required to abate any releases or threatened releases of hazardous substances(with attached service list.	Basil Constantelos-USEPA	See service list	Correspondence
	3	85/06/06	Notice that a group of PRP's have formed a steering committee.	Duane Triemstra-Steering Com.	John Oaks-USEPA	Correspondence
	3	85/07/18	Letter to KL Avenue Steering Committee providing information on what the USEPA will require of them in performance of an Initial Remedial Measure(IRM).	William Hains-USEPA	D.Triemstra-Steering Comm	Correspondence
	4	85/07/19	Letter providing the steering committee with information on what the USEPA will require of them in performing an Initial Remedial Measure (IRM).	Williams Hains-USEPA	D.Triemstra-Steering Comm	Correspondence
	7	85/08/13	Modified Work Plan proposal for the RI/FS.	Duane Triemstra-Steering Com.	William Hains-USEPA	Correspondence
	8	85/09/17	Request to eight PRP's that they voluntarily perform the work required to abate any releases or threatened releases of hazardous substances.	USEPA	see title	Correspondence
	10	85/09/17	Second Request for Information	USEPA	see title	Correspondence

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Date 12 30 89

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WEST KL AVENUE LANDFILL
KALAMAZOO COUNTY, MICHIGAN

FICHE FRAME PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE
		to provide alternate drinking water sources through the drilling of deep wells to the lower aquifer.			
1	83/11/09	Approval of gas recovery plan with certain stipulations.	Susan Peeles-MDNR	E.Pineburg-Amer.GasRecov.	Correspondence
2	83/11/21	Concerns of the MDNR with respect to the proposed gas recovery system.	Deborah Drucker-MDNR	J.Akers-Kal.Co.HealthDept	Correspondence
5	83/12/20	Letter from American Gas Recovery Corp. to address several "important issues" regarding the proposed gas recovery process and a request that the USEPA send a letter which acknowledges agreement with the project and the listed stipulations.	D.Ehrlich-American Gas Recovery Co.	Gloria Small Moran-USEPA	Correspondence
2	84/04/11	Letter informing recipient that the USEPA does not object to the proposed gas recovery project nor can they formally approve of the project. Also, the USEPA requests that any notifications, reports, and summaries that they deem appropriate be sent to Ken Banaszek of the USEPA.	Gloria Small Moran-USEPA	J.Sermania-Amer.GasRecove	Correspondence
2	84/05/23	Request for removal from the NPL.	Dean Holub-Co. of Kalamazoo	Gloria Small Moran-USEPA	Correspondence
3	84/08/23	County to proceed to control leachate breakouts and proceed with development of a proposal to cover portions of the upper plateau using paper mill sludge.	D.Kirby-Kalamazoo Co.Bd. of Comm.	Galen Kilmer-MDNR	Correspondence
2	84/09/07	MDNR request that the USEPA carry out a CERCLA RI/FS	Ronald Skoog-MDNR	Valdas Adamkus-USEPA	Correspondence

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WEST KL AVENUE LANDFILL
KALAMAZOO COUNTY, MICHIGAN

FICHE/FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE
	2	00/00/00	Notification that the USEPA will terminate the RI/FS negotiations and proceed with a Government funded RI/FS.	Basil Constantelos-USEPA	B.Triemstra-Steering Com.	Correspondence
	1	72/01/12	Notice that it is a violation to accept liquid waste for disposal.	Fred Kellow-Mich.DeptofPublicHealth	Wes Freeland-Kalamazoo Co	Correspondence
	2	75/10/13	Notice of Violation.	Leonard Zalewski-MDNR	Wes Freeland-KalamazooCo.	Correspondence
	2	76/01/13	Notice of Intent: Will be unable to grant a license to the site unless MDNR recommendations are followed to prevent further environmental degradation.	Leonard Zalewski-MDNR	W.Freeland-Kalamazoo Co.	Correspondence
	2	76/03/11	Indications that the on-site well may be contaminated and that there was a short-term leachate flow from the landfill into Bonnie Castle Lake.	Dr.Howard Tanner-MDNR	R.Snell-Wilkins & Wheaton	Correspondence
	2	76/04/28	Confirmation that wells on the site are recieving contamination.	Leonard Zalewski-MDNR	W.Freeland.Kalamazoo Co.	Correspondence
	1	78/07/27	Notice of inadequate daily cover,odor emissions, improper sump tank discharge and leachate discharge.	James Akers-KalamazooCo.HealthDept.	John Balkema	Correspondence
	28	79/06/14	Acknowledgement of MDNR directives suspending the license of the landfill and ordering closure of the site and an attached series of documents which report on County actions, findings and recommendations pursuant to MDNR Directives.	David Kirby-Kal. Co. Bd. of Comm.	Dr.H.Tanner-MDNR	Correspondence
	1	79/10/03	Michigan Department of Public Health approval of a proposal	William Kelley-MDPH	J.Akers-Kalamazoo Co.H.D.	Correspondence

ADMINISTRATIVE RECORD INDEX

WEST KL AVENUE LANDFILL
KALAMAZOO COUNTY, MICHIGAN

FICHE/FRAME PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE
		cleanup of KL Landfill"			
2	87/02/11	News Art. "County expected to help fund private study of KL Landfill"	Gazette		Newspaper Article
1	86/04/28	Agenda of Public Meeting to be held on April 28, 1986 at 7:00 p.m., Oshtemo Township Hall	Reynolds & Cozza - USEPA		Other
3	88/01/28	West KL Ave. PRP List as of 1/28/88.	Dan Cozza - USEPA		Other
7	88/02/19	Stipulation and Consent Order in the case of Campbell, et al v. Kalamazoo County, et al., case no. A-792-80-682 CE; Circuit Court, Co. of Kalamazoo, Mich.			Pleadings/Orders
7	00/00/00	Proposed Monitoring And Sampling Programs For The Kalamazoo County Landfill Section 21, Oshtemo Township.			Reports/Studies
10	00/00/00	Hazardous Ranking System Scoring Sheets	Centre-MDNR & Ostrodka-USEPA		Reports/Studies
16	00/00/00	"Spatial And Temporal Variations Of Synthetic Organics In The Contaminant Plume From The KL Landfill"	Broede & Passero-Western Michigan U		Reports/Studies
17	00/00/00	"Inorganic Geochemistry of the KL Landfill Leachate Plume"	Kehew, Passero&Rudder-West Mich. U.		Reports/Studies
150	00/00/00	West KL Avenue Landfill Data Summary For Rounds I And II, Phase I.	CDM	USEPA	Reports/Studies
19	75/09/00	"The Kalamazoo County Landfill At KL Avenue In Oshtemo Township-Evidence Against Its Expansion and For Its Early Closing."	Oshtemo Lakes Assoc., et al	MDNR, MDPH, et al	Reports/Studies
4	79/11/27	Potential Hazardous Waste	John Paakaola-USEPA		Reports/Studies

ADMINISTRATIVE RECORD INDEX

WEST KL AVENUE LANDFILL
KALAMAZOO COUNTY, MICHIGAN

FICHE/FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE
			Site Identification and Preliminary Assessment			
	29	80/03/00	Closeout Plan For "KL" Avenue Landfill.	Wilkins & Wheaton	Kalamazoo County	Reports/Studies
	106	81/06/00	Hydrogeologic Investigation For The Kalamazoo County KL Avenue Sanitary Landfill.	Passero-WMU & Wilkins&Wheaton	Kalamazoo CTo.Bd.ofHealth	Reports/Studies
	245	81/06/00	"Hydrogeologic Investigation For The Kalamazoo County KL Avenue Landfill; Vol.II (Figures,Appendices,Plates)"	Passero-WMU & Wilkins & Wheaton	KalamazooCo.Bd.ofHealth	Reports/Studies
	14	82/05/24	Site Inspection Report	Sause & Bartholomew-Ecol. & Envir.	USEPA	Reports/Studies
	19	82/11/10	Hazardous Ranking System Scoring Package	Steve Ostrodka-USEPA	USEPA	Reports/Studies
	5	83/01/25	Preliminary Assessment	Daniel Sewall-Ecology & Environment	File/USEPA Region V	Reports/Studies
	5	83/04/12	Preliminary Assessment	Anne C. Sause-Ecology & Environment	File/USEPA Region V	Reports/Studies
	18	83/10/00	Methane Gas Recovery At The K L Avenue Landfill Kalamazoo County.	American Gas Recovery Corp.	MDNR	Reports/Studies
	59	84/03/00	"Addendum I To The Hydrogeologic Investigation For The KL Ave. Sanitary landfill Kalamazoo Co., Michigan Water Quality 1980-1983"	Passero-W.Mich.U. & Wilkins&Wheaton		Reports/Studies
	22	84/10/00	Existing Conditions Memorandum	CDM	USEPA	Reports/Studies
	33	84/10/15	Work Plan Memorandum	Ross & Hawthorne - CDM	Bartelt & Kney - USEPA	Reports/Studies
	8	84/11/02	Site Personnel Protection and Safety Evaluation Form. Used as guidance during the initial site reconnaissance survey.	Ron Ross - CDM	James Kney - USEPA	Reports/Studies
	23	85/02/00	Final Community Relations	USEPA		Reports/Studies

ADMINISTRATIVE RECORD INDEX

WEST KL AVENUE LANDFILL
KALAMAZOO COUNTY, MICHIGAN

FICHE/FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE
			Plan.			
	90	85/04/00	Work Plan for RI/FS Vol. 1	CDM	USEPA	Reports/Studies
	48	85/05/00	Health and Safety Plan	CDM	USEPA	Reports/Studies
	93	86/03/26	"An Evaluation of the Effectiveness of Bentonite as a Soil Additive for the Cover Material on the KL Ave. Landfill, Kalamazoo, Michigan"	Neal J. Casey-West.Mich.U.:Grad.Col		Reports/Studies
	135	86/08/00	Quality Assurance Project Plan (QAPP)	CDM	USEPA	Reports/Studies
	165	87/02/00	Subsurface Investigation West KL Ave. Landfill	Earth Engineering & Sciences, Inc.		Reports/Studies
	11	87/05/00	Technical Memorandum Phase I Remedial Investigation Field Activities Summary (Hydrogeologic Work).	CDM	USEPA	Reports/Studies
	13	87/05/00	Technical Memorandum Phase I Remedial Investigation Surface Soil, Surface Water And Sediment Sampling Activities.	CDM	USEPA	Reports/Studies
	13	87/05/06	Addendum to Quality Assurance Project Plan.	CDM	Kelma & Cozza - USEPA	Reports/Studies
	6	87/06/00	Technical Memorandum Remedial Investigation Field Activities Round II Ground Water And Soil Sampling.	CDM	USEPA	Reports/Studies
	57	87/09/00	Health and Safety Plan for Phase II Remedial Investigation Activities.	Camp Dresser McKee (CDM)	USEPA	Reports/Studies
	36	87/10/00	Work Plan Addendum For West KL Avenue Landfill Remedial Investigation/	CDM	USEPA	Reports/Studies

ADMINISTRATIVE RECORD INDEX

WEST KL AVENUE LANDFILL
KALAMAZOO COUNTY, MICHIGAN

FICHE/FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE
			Feasability Study Phase II.			
	129	88/01/00	Quality Assurance Project Plan (QAPP) for Phase II Investigation Activities.	CDM	USEPA	Reports/Studies

ADMINISTRATIVE RECORD SAMPLING/DATA INDEX
FOR THE WEST KL AVENUE LANDFILL - KALAMAZOO COUNTY, MICHIGAN.
DOCUMENTS ARE NOT COPIED BUT MAY BE REVIEWED AT THE
USEPA REGION V OFFICES, CHICAGO, ILLINOIS.

DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE
00/00/00	Test Well #4 Analytical Reports	KAR Laboratories	Kalamazoo Co.Health Dept.	Sampling Data
00/00/00	Well monitoring sampling results from wells MW1, MW2, M3A, MW7, MW8, MW9 and County Wells.	USEPA CLP		Sampling Data
00/00/00	Test Well #4 Data Sheets	USEPA CLP	USEPA	Sampling Data
00/00/00	Monitoring Well #5 Data Sheets	USEPA CLP	USEPA Reg. V	Sampling Data
00/00/00	Monitoring Well #4 (deep) Data Sheets	USEPA CLP	USEPA Reg. V	Sampling Data
00/00/00	Monitoring Well #6 (deep) Data Sheets	USEPA CLP	USEPA Reg. V	Sampling Data
00/00/00	Residential Well Sampling Results	USEPA CLP	USEPA Reg. V	Sampling/Data
00/00/00	Monitoring Well #3 Data Sheets	USEPA CPL	USEPA Region V	Sampling Data
79/02/27	Analyses representing ground and suface water samples collected on 11/19/78 and groundwater samples collected on 1/9/79 (with cover letter).	Jack Bails-MDNR	Robert Courchaine-MDNR	Sampling/Data
80/12/04	Samples from West KL Ave.	Kalamazoo County Health Dept.		Sampling/Data
82/07/14	Analytical Results for KL Ave. Mich.Nitro 006 Low Soil Org.	Bob Bartholomew-Geol. & Envir.	USEPA	Sampling/Data
82/09/14	Analytical Results for KL Ave. Mich. Nitro 06 Low Water & Soil Inorg.	Don Sevall-Geol. & Envir.	USEPA	Sampling/Data
83/09/12	September 1983 Monitoring Results. Samples from Monitoring and Test Wells.	KAR Laboratories	Kalamazoo Co.Health Dept.	Sampling/Data

ADMINISTRATIVE RECORD SAMPLING/DATA INDEX
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DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE
86/04/02	Analytical Reports from private residential water supply wells all with sample dates of 3/10/86.	KAR Laboratories	Kalamazoo Co.Health Dept.	Sampling Data
86/05/13	Test well results from 1980 until March, 1986.	Triemstra-Kal.Co.Bd.ofCommissioners	Dan Cozza-USEPA	Sampling Data
86/10/02	Sample results of surface water testing.	California Analytical Laboratories	USEPA	Sampling Data
86/10/02	Results of the KL Landfill area groundwater samples submitted Sept. 3, 1986.	William Bosma-KAR Laboratories	Kalamazoo Co.Health Dept.	Sampling Data
86/10/03	Sample results for On-site soil testing	California Analytical Laboratories	USEPA	Sampling [illegible]
86/10/03	Analysis results for samples collected at KL Landfill on May 20, 1986	Frank Ballo-MDNR	Dan Cozza - USEPA	Sampling/Dat
86/10/04	Off-site Surface Soil Testing Results.	California Analytical Laboratories	USEPA	Sampling/Dat
86/10/04	Results of Sediment Sampling	California Analytical Laboratories	USEPA	Sampling/Dat
86/10/23	USEPA data review for data set SF3551.	Region V CRL	USEPA	Sampling/Dat
86/12/05	Organics Analysis Data Sheet for sample MR1622-1	Wadsworth Labs.	USEPA	Sampling/Da
86/12/05	Organics Analysis Data Sheet for sample MR1620-1	Wadsworth Labs.	USEPA	Sampling/Da
86/12/05	Organics Analysis Data Sheet for sample MR1621-1	Wadsworth Labs.	USEPA	Sampling/Da
86/12/05	Organics Analysis Data Sheet for sample MR1627-1	Wadsworth Labs.	USEPA	Sampling/Da
86/12/17	Inorganic Analysis Data Sheet for case 06570.	Rocky Mountain Analytical	USEPA CLP - Virginia	Sampling/D
86/12/22	USEPA data review of data set SF3620	USEPA Reg. V CRL	CDM	Sampling/D.

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DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE
87/01/05	USEPA data review of data set SF3551	USEPA Reg. V CRL	CDM	Sampling Data
87/01/05	USEPA data review of data set SF3643	USEPA Reg. V CRL	CDM	Sampling Data
87/01/07	USEPA Data review of data set SF3643	USEPA Reg. V CRL	CDM	Sampling Data
87/01/07	USEPA data review of data setr SF3627	USEPA Reg. V CRL	CDM	Sampling Data
87/01/07	USEPA data review of data set SF3627	USEPA Reg. V CRL	CDM	Sampling Data
87/01/08	Inorganic Analysis Data Sheet for case #6610	Rocky Mountain Analytical	USEPA CLP - Virginia	Sampling Data
87/01/08	USEPA data review of data set SF3628	USEPA Reg. V CRL	CDM	Sampling Data
87/01/08	USEPA data review of data set SF3662	USEPA Reg. V CRL	CDM	Sampling Data
87/01/08	USEPA data review of data set SF3665	USEPA Reg. V CRL	CDM	Sampling Data
87/01/10	Organics Analysis Data Steet for sample #EI658	Enseco	USEPA	Sampling Data
87/01/10	Organics Analysis Data Sheet for sample #EI659	Enseco	USEPA	Sampling Data
87/01/13	USEPA data review for data set SF3689	USEPA Reg. V CRL	CDM	Sampling/Data
87/01/23	Precision and accuracy Analyses for data set SF3700	USEPA Reg. V CRL	Data user	Sampling Data
87/01/29	USEPA data review of data set SF3699	USEPA Reg. V CRL	CDM	Sampling/Data
87/02/03	Organic Analysis Data Sheets for sample numbers EI655,EI656 and EI657.	TMA/ERG Labs	USEPA	Sampling/Data
87/02/04	USEPA Data Review of	USEPA Reg. V CRL	CDM	Sampling/Data

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FOR THE WEST KL AVENUE LANDFILL - KALAMAZOO COUNTY, MICHIGAN.
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DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE
	data set SF3707			
87/03/12	USEPA data review for data set SF3707	Reg. V CRL	USEPA	Sampling Data
87/04/06	Results of the KL Landfill area groundwater samples submitted March 11, 1987.	William Boeve-KAR Laboratories	Kalamazoo Co.Health Dept.	Sampling Data
87/06/10	Kalamazoo County contractor (Dames & Moore) summary of split sample results from the first round of sampling conducted by CDM for well numbers MW-1 through MW-9.	D.Friesstra-Kalamazoo County	Dan Cozza-USEPA	Sampling Data
87/06/26	USEPA data review for data set SF4005	Reg. V CRL	USEPA	Sampling/Data
87/07/07	Review and data in EPA data set SF4005: ten water samples .	CRL	CDM	Sampling/Data
87/07/08	Review and data in USEPA data set SF4005: 14 water samples analyzed for volatiles, semi-volatiles, PCB's and pesticides.	CRL-USEPA	CDM	Sampling/Data
87/07/08	Review and data for USEPA data set SF 4005: 14 water samples analyzed for total alkalinity,chloride,sulfate, total organic carbon,total phosporus, nitrite, nitrate and ammonia.	USEPA_CRL	CDM	Sampling/Data
87/07/14	Review and data in EPA data set SF4005: 14 water samples analyzed for metals and cyanide.	CRL	CDM	Sampling/Data

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WEST KL LANDFILL, KALAMAZOO COUNTY, MICHIGAN
GUIDANCE DOCUMENTS FOR THE ADMINISTRATIVE RECORD
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TITLE	AUTHOR	DATE
Timely Initiation of Responsible Party Searches, Issuance of Notice Letters, and Sources of Information.	USEPA	[illegible]
NEIC Policy and Procedure Manual	USEPA	85 [illegible]
Participation of Potentially Responsible Parties in Development of RemedialInvestigation and Feasability Studies under CERCLA.	USEPA	84 [illegible]
Procedures for Issuing Notice Letters.	USEPA	84 [illegible]
Guidance on Remedial Investigations and Feasability Studies.	USEPA	85 [illegible]
State Participation in the Superfund Remedial Program.	USEPA	84 [illegible]
Interim CERCLA Settlement Policy	USEPA	84 [illegible]
Community Relations in Superfund: Handbook.	USEPA	83 [illegible]
Community Relations Activities at Superfund Enforcement Sites.	USEPA	85 [illegible]
Interim Guidelines and Specifications for Preparing QAPP's (QAMS-005/80)	USEPA	80 [illegible]
Interim Standard Operating Safety Guides.	USEPA	82 [illegible]
CERCLA Compliance with Other Environmental Statutes	USEPA	85 [illegible]
Remedial Action at Waste Disposal Sites, Handbook	USEPA	85 [illegible]
Preparation of Records of Decision for Fund-Financed and Responsible Party Remedial Actions.	USEPA	84 [illegible]

WEST KL LANDFILL, KALAMAZOO COUNTY, MICHIGAN
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TITLE	AUTHOR	
Handbook for Evaluation of Remedial Action Technology Plans	USEPA	[illegible]
Superfund Remedial Design and Remedial Action Guidance	USEPA	[illegible]
Policy on Cost-Sharing at Publicly-Owned Sites.	W.Hedeman-USEPA	[illegible]
State Participation in the Superfund Remedial Program	L.Thomas-USEPA	[illegible]
Participation of Potentially Responsible Parties in Development of Remedial Investigations and Feasability Studies under CERCLA.	L.Thomas-USEPA	[illegible]
Interim Procedures for Deleting Sites from the National Priorities List.	L.Thomas-USEPA	[illegible]
Interim Standard Operating Safety Guides, Revised September, 1982.	W.Hedeman-USEPA	[illegible]
Community Relations in Superfund: A Handbook.	USEPA	[illegible]
CERCLA Compliance Enforcement Policy Compendium.	USEPA	[illegible]
State Participation in the Superfund Remedial Program.	USEPA	[illegible]
USEPA Drawer 1: Endangerment Assessment Handbook	USEPA	[illegible]
USEPA drawer 1: Interim CERCLA Settlement Policy	USEPA	[illegible]
USEPA drawer 1: QAMS - 005/80	USEPA	[illegible]
USEPA drawer 2: RI/FS Guidance	USEPA	[illegible]
USEPA drawer 2: RD/RA Guidance	USEPA	[illegible]

WEST KL LANDFILL, KALAMAZOO COUNTY, MICHIGAN
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TITLE	AUTHOR	DATE
USEPA drawer 2: Standard Operating Safety Guides	USEPA	[illegible]
USEPA drawer 5: Superfund - What It Is, How It Works.	USEPA	[illegible]
USEPA drawer 5: Groundwater	USEPA	[illegible]
USEPA drawer 6: Community Relations in Superfund.	USEPA	[illegible]
USEPA drawer 6: Superfund Federal Lead Remedial Project Management Handbook	USEPA	[illegible]
USEPA drawer 6: RCRA Orientation Manual	USEPA	[illegible]
OWSER Directive # 9280.0-02 Policy On Flood Plains And Wetlans Assessments.	USEPA	85
OWSER Directive # 9285.1-01-B Standard Operating Safety Guide Manual.	USEPA	84
OWSER Directive # 9285.4-01 Superfund Public Health Evaluation Manual.	USEPA	86
OWSER Directive # 9295.1-01 MOU Between The ATSDR and EPA.	USEPA	85
OWSER Directive # 9355.0-03 Uncontrolled Hazardous Waste Site Ranking System - A Users Manual.	USEPA	82
OWSER Directive #9355.0-04 Superfund Remedial Design And Remedial Action Guidance.	USEPA	85
OWSER Directive 9355.0-04A Superfund Remedial Action And Action Guidance Guidance	USEPA	86

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GUIDANCE DOCUMENTS FOR THE ADMINISTRATIVE RECORD
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TITLE	AUTHOR	DA
OSWER Directive # 9344.0-05C Guidance On Feasability Studies Under CERCLA.	USEPA	85
OSWER Directive # 9355.0-06B Guidance On Remedial Investigations Under CERCLA.	USEPA	85
OSWER Directive #9355.0-08 Modeling Remedial Actions At Uncontrolled Hazardous Waste Sites	USEPA	85
OSWER Directive # 9380.0-04 Remedial Action At Waste Disposal Sites Handbook(Revised).	USEPA	84
OSWER Guidance #9834.1 Guidance On Issuing Notice Letters	USEPA	84
Timely Initiation Of Responsible Party Searches, Issuance Of Notice Letters And Releases Of Information	USEPA	85
OSWER Directive #9835.1 Participation Of Potentially Responsible Parties In Development Of Remedial Investigation And Feasability Studies.	USEPA	84
OSWER Directive # 9835.3 Model Administrative Order For Private Party Conduct Ofer RI/FS.	USEPA	85
OSWER Directive #9835.4 Interim Guidance: Streamlining The Settlement Decision Process	USEPA	8
OSWER Directive # 9000.0 FY 1986 Superfund Comprehensive Accomplishments Plan.	USEPA	8

ADMINISTRATIVE RECORD INDEX UPDATE NO. 1
USEPA Remedial Action Superfund Site
West KL Avenue Landfill
Kalamazoo, Michigan

FI FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOCNUMBER
	5	87/03/25	Letter commenting on site activity with forwarding letter	Kalamazoo Cty. Board	Cozza, USEPA	Correspondence	1
	1	87/03/31	Letter responding to Dames and Moore's comments about personnel and sampling screened intervals	Milejczak, MDNR	Cozza, USEPA	Correspondence	2
	4	87/04/08	Letter responding to Kalamazoo County Board of Commissioners 2-25-87 letter re: Field work at the West KL site	Bevar, CDM	Cozza, USEPA	Correspondence	3
	2	87/08/27	Letter recapping 8-24-87 meeting between MDNR and Mr. Guayan- former employee of Thomas Solvent Co.	Ramsey, MDNR	Reichel, MI AG's Office	Correspondence	4
	2	88/11/18	Letter updating area residents about the cleanup effort	Cozza, USEPA	area residents	Correspondence	5
	2	88/12/06	Letters re: Test pit operation at the West KL site	Maier, Oshtemo Lks. Assoc	Cozza, USEPA	Correspondence	6
	2	88/12/20	Letter re: Test pit operation at the West KL site	Cozza, USEPA	Maier, Oshtemo Lks. Assoc	Correspondence	7
	2	89/03/30	Letter commenting on the Remedial Investigation Report	Taszreak, MDNR	Cozza, USEPA	Correspondence	8
	56	89/08/24	Letter forwarding comments on the Alternatives Array document for the West KL site	Cozza, USEPA	Weston, Inc.	Correspondence	9
	1	89/10/18	Letter forwarding comments	Taszreak, MDNR	Cozza, USEPA	Correspondence	10

ADMINISTRATIVE RECORD INDEX UPDATE NO. 1
USEPA Remedial Action Superfund site
West KL Avenue Landfill
Kalamazoo, Michigan

FICHE/FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOCNUMBER
			on upcoming Feasibility Study				
	2	89/10/27	Letter confirming MDNR comments about upcoming Feasibility Study	Cozza, USEPA	Tanzreek, MDNR	Correspondence	11
	55	89/10/31	Letter forwarding information describing the application of fixed film biological reactors for the treatment of contaminated groundwater	Sanger, Upjohn Co.	Cozza, USEPA	Correspondence	12
	37	90/02/00	Letters, etc. commenting on draft Feasibility Study	various authors	various recipients	Correspondence	13
	3	90/02/07	Letter responding to Draft FS verbal comments made by USEPA	Weston, Inc.	Cozza, USEPA	Correspondence	14
	12	90/02/08	Letter updating the Kalamazoo County Board of Commissioners about site activities and forwarding a PRP list	Cozza, USEPA	Kalamazoo Cty.Board	Correspondence	15
	16	90/02/26	Certified letter giving West KL PRPs notice of potential liability	Kelley, USEPA	PRPs	Correspondence	16
	2	90/03/28	Letter re: The use of AlgaSORB for inorganic contaminant removal	Roy F. Weston, Inc.	Cozza, USEPA	Correspondence	17
	6	89/11/00	Fact Sheet: West KL Avenue Landfill-November 89	MDNR		Fact Sheet	18
	4	88/11/16	Meeting Notes from 11-10-88 meeting between USEPA and KL site PRPs with sign-in sheet	Cozza, USEPA	file	Meeting Notes	19

ADMINISTRATIVE RECORD INDEX UPDATE NO. 1
USEPA Remedial Action Superfund Site
West KL Avenue Landfill
Kalamazoo, Michigan

FICHE FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOCNUMBER
	14	89/10/12	Meeting Notes from 10-12-89 meeting between USEPA and West KL PRPs	Cozza, USEPA	File	Meeting Notes	20
	2	90/03/07	Agenda from 3-7-90 Technical Meeting held in Chicago	USEPA		Meeting Notes	21
	3	90/03/12	Meeting Agenda and Sign-In Sheet from 3-12-90 meeting in Kalamazoo, MI	USEPA		Meeting Notes	22
	2	86/05/26	Memo re: The annual sampling conducted at the West KL site	Cozza, USEPA	File	Memorandum	23
	5	89/04/20	Memo re: Water Division Review of the Draft Remedial Investigation Report and Risk Assessment for the West KL site	Sutfin, USEPA	Constantelos, USEPA	Memorandum	24
	4	89/08/14	Memo re: Water Division Review of the Alternatives Array for the West KL site	Sutfin, USEPA	Constantelos, USEPA	Memorandum	25
	4	87/08/14	Outline of test pitting plan with fax cover sheet	Hillejezak	Cozza, USEPA	Other	26
	15	89/09/11	Applicable or Relevant and Appropriate Requirements (ARARs) documents	Taszreak, MDNR	Cozza, USEPA	Other	27
	161	78/00/00	Report: Kalamazoo County-Geology and the Environment	Western Michigan U.		Reports/Studies	28
	205	88/12/21	Quality Assurance	CDM	USEPA	Reports/Studies	29

ADMINISTRATIVE RECORD INDEX UPDATE NO. 1
USEPA Remedial Action Superfund Site
West KL Avenue Landfill
Kalamazoo, Michigan

FICHE FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOCNUMBER
			Project Plan (QAPP) for Phase III RI/FS Activities at the KL site with forwarding memo				
	26	89/02/00	Technical Work Plan for West KL Volume I: Technical Scope of Work	Weston, Inc.	USEPA	Reports/Studies	30
	22	89/04/00	Technical Memo: Remedial Investigation Field Activities for Phase III Test Pit Installation at West KL site	CDM	USEPA	Reports/Studies	31
	391	89/05/00	Remedial Investigation Report	CDM	USEPA	Reports/Studies	32
	469	89/05/00	Remedial Investigation Report Appendices: Appendix A Appendix B Appendix C Appendix D Appendix A for Section 7	CDM	USEPA	Reports/Studies	33
	43	89/05/00	Technical Memorandum: Evaluation of Preliminary Remedial Technologies for the West KL site	Weston, Inc.	USEPA	Reports/Studies	34
	203	90/03/00	Public Comment Feasibility Study for West KL	Roy F. Weston, Inc.	USEPA	Reports/Studies	35

GUIDANCE DOCUMENTS INDEX Update No.1
West IL Avenue Landfill
Guidance Documents are available for review at
USEPA Region V-Chicago IL

TITLE	AUTHOR	DATE
USEPA Guidance Memo: Discharge of Wastewater from CERCLA sites into POTWs	USEPA	08/04/15

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All raw data and QC packages are available for review at
U.S. EPA - Region V, Chicago, IL

Page No. 1
?/19/90

ADMINISTRATIVE RECORD INDEX UPDATE NO. 2
USEPA Remedial Action Superfund Site
West KL Avenue Landfill
Kalamazoo, Michigan

FICHE FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOCNUMBER
	2	87/08/27	Letter re: Report on inspection made at the KL Landfill and the interview that was held with former Thomas Solvent Co. employee	Sgt. T.Russey-MDNR	R.Reichel-MI Atty Gen	Correspondence	1
	32	90/02/22	Letter re: Comments on the FS Report for the West KL Avenue Landfill, with comments from other USEPA Divisions and MDNR attached	D.Cozza-USEPA	P.Krishnan-Roy F. Weston	Correspondence	2
	1	90/03/01	Letter re: Informing residents of Kalamazoo County that the RI/FS portion of the Superfund process will soon be concluded and the results of the RI is available	D.Cozza-USEPA	Kalamazoo Cnty. Residents	Correspondence	3
	1	90/04/05	Letter forwarding a copy of the Public Comment FS Report	D.Cozza-USEPA	D.Triemstra & W.Whitlock	Correspondence	4
	1	90/06/07	Letter re: West KL Avenue Landfill Proposed Plan and Public Comment Period; copies forwarded	D.Cozza-USEPA	D.Triemstra-KC Board Comm	Correspondence	5
	8	90/06/27	Letter re: Informing USEPA that a KL Ave. PRP group has been formed and has hired the environmental services firm of Geraghty & Miller, Inc. to provide the group with technical assistance in reviewing the FS, Proposed Plan, and related documents, with a copy of a memorandum identifying some initial	J.Whitlock-The Upjohn Company	D.Cozza-USEPA	Correspondence	6

ADMINISTRATIVE RECORD INDEX UPDATE NO. 2
USEPA Remedial Action Superfund Site
West KL Avenue Landfill
Kalamazoo, Michigan

FICHE FRAME PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOCUMENT
		comments raised during the Geraghty & Miller review, attached				
2	90/07/05	Letter re: MDNR concurs with the selected remedy outlined in the Proposed Plan for West KL Avenue Landfill	J.Truchan-MDNR	M.Niedergang-USEPA	Correspondence	[illegible]
3	90/07/25	Letter re: The County of Kalamazoo submits the following comments to the USEPA on the proposed remediation plan for West KL Avenue Landfill	W.Freeland-Kalamazoo County Government	D.Cozza-USEPA	Correspondence	8
2	90/07/27	Letter re: A Kalamazoo County Commissioner expresses concern about the Proposed Plan for the KL Ave. Landfill site submitted by EPA and MDNR and request that EPA and MDNR consider the comments and recommendations that will soon be submitted by Geraghty and Miller	C.Sumney-Kalamazoo County Government, Board of Commissioners	D.Cozza-USEPA	Correspondence	9
5	90/07/31	Letter re: Concerned resident of Kalamazoo states that for the record, opposes any action being taken on the clean up of KL Ave. Landfill and listed several reasons. A second letter from the concerned resident's spouse is also attached with further views expressed	Theodore & Betty Snow-Concerned Residents	Taszreak-MDNR,Cozza-USEPA	Correspondence	10
2	90/08/03	Letter re: The Oshtemo Lakes Association expresses having qualms	P.Maier-Oshtemo Lakes Association	D.Cozza-USEPA	Correspondence	11

ADMINISTRATIVE RECORD INDEX UPDATE NO. 1
USEPA Remedial Action Superfund Site
West KL Avenue Landfill
Kalamazoo, Michigan

FICHE FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOCNUMBER
			about some of the procedures USEPA has proposed as a remedy				
	1	90/08/06	Letter re: Resident of Kalamazoo expresses concern for the future clean up plans of the KL Landfill; hopes that any 'clean up' action will not adversely effect the area surrounding or the level and quality of water in Bonnie Castle Lake	G.Rein-Concerned Resident	D.Cozza-USEPA	Correspondence	12
	1	90/08/07	Letter re: Concerned resident feels it would be unfair to residents west of the landfill to have deed restrictions put on their property; feels that installing a low cost fence around the landfill would suffice at this present time	Jennie Snow-Concerned Resident	D.Cozza-USEPA	Correspondence	13
	2	90/08/09	Letter re: Chairman of the Kalamazoo County Board of Commissioners expresses his views on USEPA's Preferred Remedial Action Plan and lists important facts to take into consideration	N.Brenth-Kalamazoo County Government, Board of Commissioners	D.Cozza-USEPA	Correspondence	14
	2	90/08/10	Letter re: Serves as a public comment to the USEPA Proposed Plan, with regard to the alternatives	J.Balkema	D.Cozza-USEPA	Correspondence	15
	3	90/08/10	Letter re: The County of Kalamazoo has been	R.Freeland-Kalamazoo County Government	D.Cozza-USEPA	Correspondence	16

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ADMINISTRATIVE RECORD INDEX UPDATE NO. 2
USEPA Remedial Action Superfund Site
West KL Avenue Landfill
Kalamazoo, Michigan

FICHE FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOCNUMBER
			identified as a PRP and states what action plan it will take and its position on USEPA's remedial action plan				
	2	90/08/13	Letter re: Offered in support of comments by Wesley K. Freeland in his letter dated Aug. 10, 1990 and to inform USEPA that Oshtemo Township shares the goals of the County of Kalamazoo, USEPA, and MDNR to protect human health and the environment	R.Fleckenstein-Charter Township Oshtemo	D.Cozza-USEPA	Correspondence	17
	2	90/08/13	Letter re: The County of Kalamazoo expresses thanks for allowing a 60 day public comment period	T.Armstrong-Shipman & Goodwin	Hersch & Cozza-USEPA	Correspondence	18
	5	90/06/00	Fact Sheet West KL Avenue Landfill Superfund Site Kalamazoo County, MI June 1990	MDNR		Fact Sheets	19
	3	68/05/24	Maps of Operational Plan for Oshtemo Sanitary Landfill	Wayland D. Ingersoll Consulting Civil Engr. Land Surveyor	USEPA	Maps	20
	1	90/03/12	West KL Avenue Landfill Information Meeting Agenda	D.Cozza & S.Hersh-USEPA		Meeting Notes	21
	1	90/07/16	Availability Session West KL Avenue Landfill Superfund Site Agenda	USEPA		Meeting Notes	22
	2	89/10/12	10/11/89 West KL PRP Meeting, Chicago, IL	D.Cozza-USEPA	File	Memorandum	23
	1	90/04/30	Memo re: Interviewed drivers that personally	J.Kowecki-USEPA	D.Cozza-USEPA	Memorandum	24

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09/19/90

ADMINISTRATIVE RECORD INDEX UPDATE NO. 2
USEPA Remedial Action Superfund Site
West KL Avenue Landfill
Kalamazoo, Michigan

FICHE FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOCNUMBER
			took waste from Thermo Chem site to Oshteno Landfill				
	1	90/08/29	Memo re: Comments on Remedial Alternative Selection for the West KL Avenue Landfill	K.Del Toral-USEPA	D.Cozza-USEPA	Memorandum	25
	1	00/00/00	The Superfund Process	USEPA		Other	26
	13	87/12/18	Memo forwarding documents from the Thermo-Chem folders that state the waste went to a landfill	K.Brooks-OPRA	L.Smith-OPRA	Other	27
	8	90/05/00	Article titled "Ultraviolet Light, Researchers use UV light for VOC destruction"	K.Roy-Hazmat World		Other	28
	2	90/07/06	Notice: The USEPA and the MDNR will conduct a Public Hearing and a Question and Answer period concerning West KL Avenue Landfill	R.Yaszreal-MDNR	D.Cozza-USEPA	Other	29
	3	90/07/23	This statement has been prepared for the Public Hearing on July 23, 1990 regarding the West KL Avenue Landfill and represent comments by the Human Services Department, with a Decision Tree attached re: Water Wells near Contamination Sites	J.Jadkowski-Human Services Dept.	Public Hearing	Other	30
	11	90/07/23	Remarks by Senator Welborn at Public Hearing, July 23, 1990	J.Welborn-State Senator	USEPA and MDNR	Other	31
	2	90/08/09	Affidavit by John Balkema, Vice-Pres. of Balkema,Inc. states	J.Heath-Notary Public		Other	32

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USEPA Remedial Action Superfund Site
West KL Avenue Landfill
Kalamazoo, Michigan

FICHE FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOCNUMBER
			that Balkema, Inc. was the second operator of the KL Avenue Landfill				
	3	90/08/09	Affidavit by Melvin L. Woolf, President of Woolf Excavating, Inc. states that they were the first operators of the KL Ave. Landfill	J.Heath-Notary Public		Other	33
	67	89/07/14	Technical Memorandum Alternatives Array Document for West KL Avenue Landfill Kalamazoo, MI	Roy F. Weston,Inc.	B.Cozza-USEPA	Reports/Studies	34
	205	90/03/00	Public Comment FS for West KL Avenue Landfill Kalamazoo, MI March 1990	Weston	USEPA	Reports/Studies	35
	34	90/06/07	Proposed Plan West KL Avenue Landfill Kalamazoo, MI	USEPA		Reports/Studies	36
	200	90/08/09	Review of USEPA Proposed Alternatives and Proposal of Additional NCP Compliant Remedial Alternatives for Implementation at the West KL Avenue Landfill, with 3 page cover letter attached	Geraghty & Miller	The West KL Ave PRP Group	Reports/Studies	37
	12	90/08/10	The KL Avenue Committee has developed an alternative remedy proposal which meets all legal requirements	J.Whitlock-Chairperson, Steering Committee The Upjohn Co.	B.Cozza-USEPA	Reports/Studies	38
	21	90/08/10	Statistical Analysis of Groundwater Chemical Monitoring Well Trends at the KL Avenue Landfill Site for the Period: 1980-1990, with cover	Dr. M.Staline, Dr.R. Passero, & S.Dykstra-Wilkins & Wheaton Environmental Services, Inc.	B.Cozza-USEPA	Reports/Studies	39

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USEPA Remedial Action Superfund Site
West KL Avenue Landfill
Kalamazoo, Michigan

FICHE FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOCNUMBER
			letter attached				
	82	90/07/23	Transcript of Public Hearing re: West KL Avenue Landfill	D.Spagnuolo-Certified Shorthand Reporter	MDNR & USEPA	Transcript	40

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ADMINISTRATIVE RECORD SAMPLING/DATA INDEX
WEST KL AVENUE LANDFILL, MI
DOCUMENTS NOT COPIED, MAY BE REVIEWED AT THE
USEPA REGION V OFFICES, CHICAGO, ILLINOIS.

DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE
90/05/02	Analytical Report on Semi-annual monitoring of KL Landfill	T. Bouma, PhD-EAR Laboratories, Inc.	P. Krause-KC Health Dept.	Sampling Data

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GUIDANCE INDEX
WEST KL AVENUE LANDFILL SITE
Guidance Documents are available for review at
USEPA Region V-Chicago IL

TITLE	AUTHOR	DATE
Evaluation of Ground-Water Extraction Remedies Volume I Summary Report	USEPA/OERR	89/09/00
Superfund Innovative Technology Evaluation (SITE) Program Superfund '89 Conference Nov. 27-29, 1990	USEPA	89/11/27
Enhanced Bioremediation Utilizing Hydrogen Peroxide as a Supplemental Source of Oxygen	USEPA/RD	90/02/00
The Superfund Innovative Technology Evaluation Program Progress and Accomplishments FY 1989	USEPA/SWER/RD	90/03/00
Drinking Water Regulations and Health Advisories	Office of Drinking Water/USEPA	90/04/00
UPDATE on the Superfund Innovative Technology Evaluation (SITE) Research Symposium April 3-5, 1990	USEPA/RREL	90/04/03

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

WEST KL AVENUE LANDFILL
LOCATED IN KALAMAZOO, MICHIGAN

SEPTEMBER 1990

United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R05-89/098
July 1989

EPA

Superfund Record of Decision:

Industrial Excess Landfill, OH

50272-101

REPORT DOCUMENTATION PAGE

1. Report No.: EPA/ROD/R05-89/098
2.
3. Recipient's Accession No.:
4. Title and Subtitle:
   SUPERFUND RECORD OF DECISION
   Industrial Excess Landfill, OH
   Second Remedial Action - Final
5. Report Date: 07/17/89
6.
7. Author(s):
8. Performing Organization Rept. No.:
9. Performing Organization Name and Address:
10. Project/Task/Work Unit No.:
11. Contract(C) or Grant(G) No.: (C) (G)
12. Sponsoring Organization Name and Address:
   U.S. Environmental Protection Agency
   401 M Street, S.W.
   Washington, D.C. 20460
13. Type of Report & Period Covered: 800/000
14.
15. Supplementary Notes:
16. Abstract (Limit: 200 words)

The 300-acre Industrial Excess Landfill site is in Uniontown, Stark County, Ohio. Several hundred residences are within a half mile of the site, and all residences and businesses in the Uniontown area rely on ground water from private well supplies. Surface water at the site flows to Metzger Ditch which is located along the eastern border of the site. The site was operated as a mixed industrial and refuse landfill from 1966 until 1980. Large amounts of fly ash and liquid wastes including latex and spent organic solvents were disposed of in the landfill between 1968 and 1972. To prevent the spread of contaminants associated with these wastes, several emergency actions have been undertaken. In 1986 an active methane extraction system was installed to prevent the offsite migration of explosive levels of methane gas. In April 1987 EPA installed air strippers in eight residences and two businesses due to the presence of low levels of volatile organic compounds. In September 1987 EPA signed a Record of Decision (ROD) to provide an alternate water supply to 100 homes west of the site to ensure that the community received safe drinking water while the final remedial action for the site was implemented. This ROD represents the final remedial action for the site and addresses the source area, gases generated within the source area, and contaminated ground water. The primary contaminants of concern affecting the soil, sediments, and ground water are VOCs including benzene, vinyl chloride, and PCE; other organics including carcinogenic PAHs; and metals. Air contamination by methane gas is (Continued on next page)

17. Document Analysis a. Descriptors
   Record of Decision - Industrial Excess Landfill, OH
   Second Remedial Action - Final
   Contaminated Media: soil, sediment, gw, air
   Key Contaminants: VOCs (benzene, PCE), other organics (methane gas, PAHs), metals

   b. Identifiers/Open-Ended Terms

   c. COSATI Field/Group

18. Availability Statement:
19. Security Class (This Report): None
20. Security Class (This Page): None
21. No. of Pages: 58
22. Price:

(See ANSI-Z39.18) See Instructions on Reverse OPTIONAL FORM 272 (4-77) (Formerly NTIS-35) Department of Commerce

16. Abstract (Continued)

also present at the site.

The selected remedial action for this site includes installing a multilayer RCRA cap over the site to prevent surface water infiltration; expanding the existing methane venting system to accommodate the potential increase of landfill gas due to the cap; extracting and treating approximately 256 million gallons of contaminated ground water by air stripping, carbon adsorption, and flocculation/sedimentation/filtration to achieve compliance with Clean Water Act NPDES discharge criteria for surface water discharge; continuing the pumping of ground water to maintain a lowered water table and protect ground water from additional contamination by the landfill; treating surface water from ponds at the site, if necessary; and dredging sediment from the ponds and ditch and incorporating them under the cap; multimedia monitoring; and institutional controls restricting future use of the site. The estimated present worth cost for this selected remedial action is $18,548,000, which includes an estimated annual O&M cost of $440,000.

DECLARATION FOR THE RECORD OF DECISION

Site Name and Location

Industrial Excess Landfill, Inc.
Uniontown, Ohio

Statement of Basis and Purpose

This decision document presents the selected final remedial action for the Industrial Excess Landfill, Inc. site, in Uniontown, Ohio, developed in accordance with CERCLA, as amended by SARA, and, to the extent practicable, the National Contingency Plan. This decision is based on the administrative record for this site. The attached index identifies the items that comprise the administrative record upon which the selection of the final remedial action is based.

The State of Ohio has concurred on the selected remedy.

Description of the Selected Remedy

This remedial action is the final action for the Industrial Excess Landfill, Inc. (IEL) site. In September 1987, U.S. EPA signed a Record of Decision for provision of an alternate water supply to approximately 100 homes near IEL whose drinking water is affected or threatened by contaminants from IEL. This final remedial action addresses the waste disposal area and the landfill gas generation and groundwater contamination associated with the waste disposal area. The remedy addresses the principal threats posed by IEL by isolating and containing wastes within the landfill, expanding the existing methane venting system for the collection and flaring of landfill gas, and by extracting and treating contaminated ground water beneath and near the landfill. Additional studies of landfill gas generation and potential migration, surface stability and hydrology, and hydrogeologic characteristics and contaminant fate and transport must be conducted during the design phase of the remedy to collect appropriate information for design of the various treatment and containment systems.

The major components of the IEL remedy include:

* Installation of a RCRA Subtitle C compliant cap over the entire surface of the landfill with surface water drainage control and discharge;

* Expansion of the existing methane venting system;

* Extraction and treatment of contaminated groundwater beneath and near the landfill until cleanup levels are achieved;

* Pumping of groundwater to maintain the water table level beneath the bottom of the wastes in IEL in order to protect groundwater from additional contamination by the landfill;

* Installation of fencing around the perimeter of the site;

* Use restrictions on future use of the site property; and

* Monitoring of the cap, ground water extraction and treatment system, and methane venting system to ensure the remedy is effective.

Declaration

The selected final remedy is protective of human health and the environment; attains Federal and State requirements that are applicable or relevant and appropriate to the remedial action; and is cost effective. This remedy utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable. A principal threat at the site, the disposal area itself, will be addressed through containment rather than treatment, and therefore, this portion of the remedy does not meet the statutory preference for treatment as a principal element of the remedy. Because of the disposal area size; the fact that there are no on-site hot spots representing major sources of contamination; and the difficulties, risk and cost involved with implementing a source treatment technology, it is not practicable to treat the source area. However, another principal threat, the groundwater contamination, will be addressed through treatment which permanently and significantly reduces the toxicity, mobility or volume of the existing groundwater contamination. In addition, landfill gas generated by the site will be collected and flared, providing additional reductions in contaminant toxicity, mobility, or volume.

Because this remedy will result in hazardous substances remaining on-site above health-based levels, a review will be conducted no less than once every five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

JUL 17 [illegible]

Date

for Valdas V. Adamkus
Regional Administrator
U.S. EPA, Region V

DECISION SUMMARY

I. Site Name, Location, and Description

The Industrial Excess Landfill (IEL) site is located in the unincorporated community of Uniontown, Ohio. Uniontown is located in Lake Township of Stark County, approximately 10 miles southeast of Akron. The site is about four-tenths of a mile south of the intersection of Cleveland Avenue and State Route 619, at 12646 Cleveland Avenue (See Figure 1).

Located on a 30 acre tract of land east of Cleveland Avenue, the site is set back from the road by a strip of land approximately 250 feet wide. This strip is occupied by 2 businesses and 6 single-family homes, one of which had been converted into a real estate office. Presently, five of the homes are occupied; the real estate office is vacant.

An additional 6 homes are located at the northern edge of the site along Hilltop Avenue and the southern curve of Amber Circle. The eastern border of the site is formed by Metzger Ditch, which drains the peat soils east and southeast of the site. A sod farm is located on the east side of Metzger Ditch. The tract of land south of the site is occupied by a seldom used sand-blasting and paint shop.

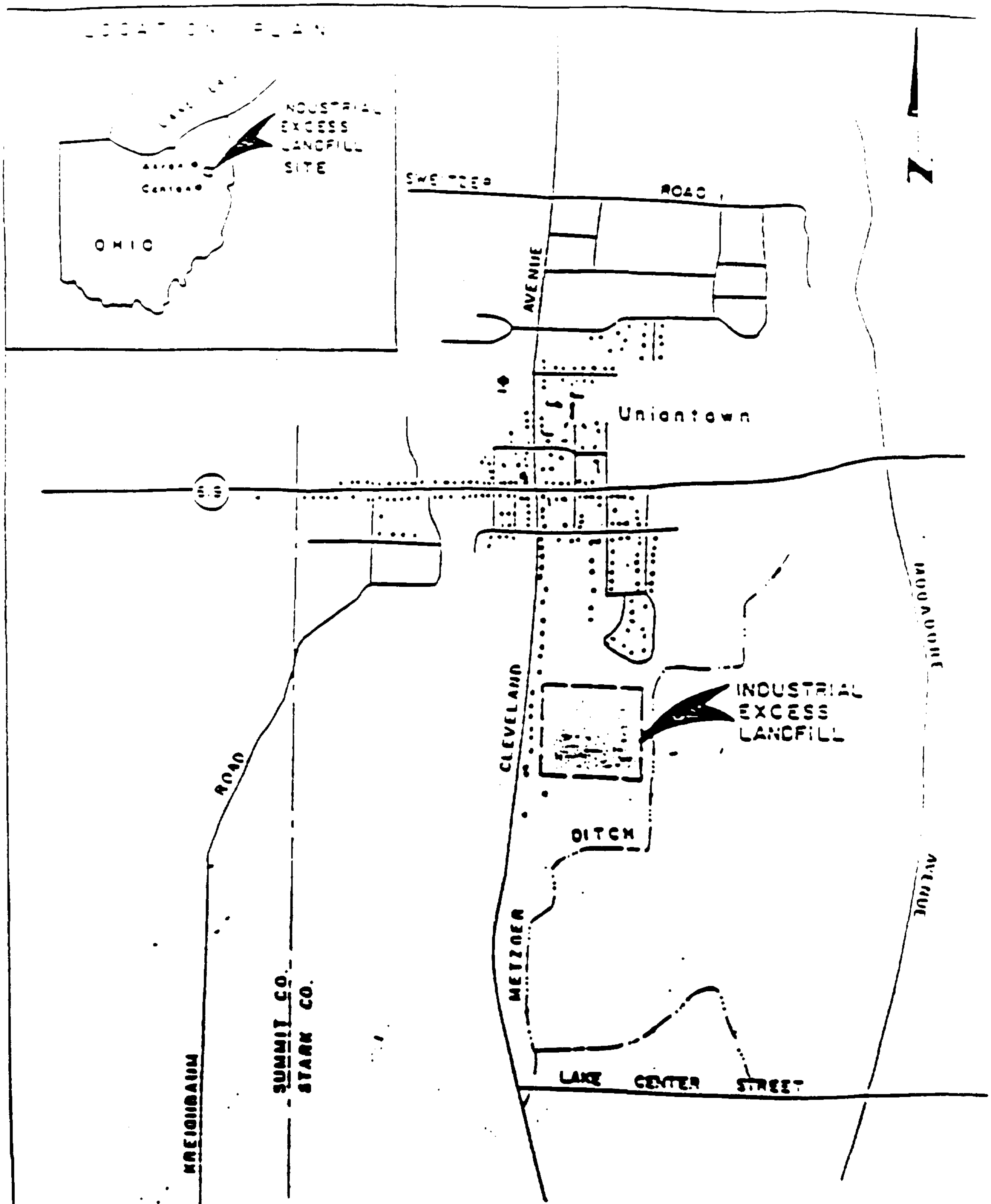
Several hundred residences are located within a half mile of the site, mainly to the north, west and southwest. All residences and businesses in the Uniontown area rely on groundwater obtained from individual or private well supplies.

Covered with grasses, small trees and shrubs, the site itself is gently rolling, with the highest elevation located at the northwest corner. The property slopes to the east and south, directing surface run-off to Metzger Ditch. The difference in elevation between the highest point and the lowest point, located at the southeast corner, is approximately 60 feet (Figure 2). There are four small ponds on the site located adjacent to Metzger Ditch.

II. Site History and Enforcement Activities

A. Operational History:

Formerly the site of a sand and gravel mining operation, IEL was operated as a mixed industrial and refuse landfill from 1966 to 1980, when it was ordered closed. During operation, the landfill accepted an assortment of household, commercial, industrial (sludges, liquids, and solids) and chemical wastes. Large amounts of flyash were accepted at IEL from 1966 until at least 1972. Most of the liquid industrial wastes, including latex, spent organic solvents, and off-spec product



scale approximate
1" : 1,550'

INDUSTRIAL EXCESS LANDFILL
STARK COUNTY, OHIO
FIGURE 1
LOCATION PLAN

7

8

INDUSTRIAL EXCESS LANDFILL
STARK COUNTY, OHIO

FIGURE 2

from the rubber industry, were dumped between 1968 and 1972. Based on interviews with the former owner and depositions of various operators, it appears as if most of the liquid waste disposal occurred on the northern one-third of the landfill. The method of disposing of these liquids was direct dumping on the ground, either in a lagoon or mixed with other waste. In 1972, the Stark County Board of Health ordered the cessation of liquids disposal. However, community residents indicate that some liquids were disposed of after that date. General organic material, including waste from the general public, was disposed of at IEL throughout its operation.

Due to public concern, and because the site was approaching its volumetric limit, the landfill was ordered closed in 1980. Approximately 80 to 85 percent of the site is underlain with waste. Depths of landfilling ranged from 60 feet at the northwest corner, to only several feet along the east ad south portions of the site. Subsequent to closure, the site was covered with a sandy, gravelly soil and seeded. The site does not have an impermeable cap or liner.

B. CERCLA Removal Activities:

In October 1984, the IEL site was proposed for inclusion on U.S. EPA's National Priorities List (NPL) of abandoned or uncontrolled hazardous waste sites eligible for investigation and cleanup under the Superfund Program. A Work Assignment was issued on December 26, 1984, for a comprehensive remedial investigation/feasibility study at the site.

A Remedial Investigation, comprised of several phases of field work was conducted between 1985 and 1988. During the Remedial Investigation, surface soils, subsurface soils, and sediments, soil gas, and ground water samples were collected and analyzed. The Remedial Investigation Report, detailing the results of the investigation, was published in July 1988. A Feasibility Study, which examined and evaluated remedial alternatives for IEL, was released for public comment on December 21, 1988. The public comment period ended June 1, 1989.

While the RI/FS was conducted, several actions were taken at IEL by U.S. EPA. In early 1986, an active methane extraction system was installed on the site by U.S. EPA's Emergency Response Team, in order to prevent the off-site migration of explosive levels of methane gas to adjacent homes. The methane venting system (MVS) consists of a series of extraction wells which collect landfill gas from depths of about 40 feet, and direct it toward a central point where the gas is then flared. For the most part, the MVS has effectively prevented off-site migration of landfill gases since its installation. Off-site soil gas samples taken in late June and early July 1989 indicated off-site migration of methane. Adjustments in the operation of the MVS quickly corrected the problem.

During April 1987, U.S. EPA's Emergency Response Team also installed air-strippers in 8 residences and 2 businesses, in response to the presence of low levels of vinyl chloride and other volatile organics in several drinking water wells. The levels of vinyl chloride observed in 3 wells equal or exceed the Maximum Contaminant Level (MCL) for vinyl chloride of 2 parts per billion (ppb).

On September 30, 1987, U.S. EPA signed a Record of Decision to provide alternate water to 100 homes located west (downgradient) of the IEL site. This area includes those homes and businesses whose groundwater is currently contaminated by the site, and those who may be affected prior to the implementation of the final site remedy. The decision is considered to be one part, or an operable unit, of the overall site remedy. The Potentially Responsible Parties (PRPs) for the IEL site were ordered to design and construct the alternate water system. Design has begun and the system is expected to be on line by summer of 1990.

C. CERCLA Enforcement Activities:

U.S. EPA issued notice letters to the IEL owner/operator's and five generators of hazardous substances disposed of at IEL in April 1985, requesting these PRPs to conduct the RI/FS for IEL. Negotiations were not successful and U.S. EPA initiated a Fund-financed RI/FS.

In August 1987, U.S. EPA issued notice letters to 10 PRPs, asking them to submit a good faith proposal for the design and construction of the alternate water supply operable unit. Negotiations were unsuccessful and none of the PRPs submitted a good faith proposal. Consequently, in December 1987, U.S. EPA issued a Section 106 Unilateral Order to the ten PRPs, ordering them to implement the operable unit. In January 1988, four of the PRPs began to comply with the Order.

In March 1989, U.S. EPA issued a general notice letter to 12 PRPs, requesting them to implement the final remedy outlined in the IEL Proposed Plan. In May 1989, U.S. EPA issued special notice letters to 15 PRPs for the IEL final remedy, establishing the statutory 60-day period for submittal by the PRPs of a "good faith proposal" to conduct the final remedial action. During the 60-day period, U.S. EPA invokes a moratorium on conducting remedial action at IEL. If U.S. EPA receives a "good faith proposal" within the 60-day period, the moratorium will be extended an additional 60 days.

III. Community Relations History

U.S. EPA and OEPA have conducted extensive community relations activities at the site. The community near IEL has been very involved in site activities throughout the Superfund process. A community group, Concerned Citizens of Lake Township (CCLT), received the first Technical Assistant Grant (TAG) in the nation. U.S. EPA and OEPA have published many fact sheets, sponsored several public meetings, and held numerous availability sessions to keep the community informed of the IEL activities.

In accordance with CERCLA Section 113, U.S. EPA published a notice in a local newspaper in mid-December 1988 announcing the availability of the IEL FS and Proposed Plan, the date and time of the availability sessions and public meeting, and the duration of the public comment period. The announcement also included a brief analysis of the Proposed Plan and alternative plans that were considered.

A 120-day public comment period for the IEL FS was established from December 21, 1988 until April 19, 1989. The comment period was subsequently extended until June 1, 1989. The length of the public comment period well exceeded the 21 days required by the NCP. A public meeting was held on March 29, 1989 in Uniontown, Ohio in accordance with CERCLA Section 117. A transcript of the meeting is contained in the IEL Administrative Record. The Responsiveness Summary contains a response to each of the significant comments, criticisms, and new data submitted in written and oral presentations. This Record of Decision serves as the statement of the basis and purpose of the selected final remedial action for IEL.

IV. Scope and Role of this Response Action

This Record of Decision addresses the final remedial action for the IEL site. The action addresses the principal threats at the site, the 30-acre waste disposal/source area and gases generated within the source area, and contaminated groundwater.

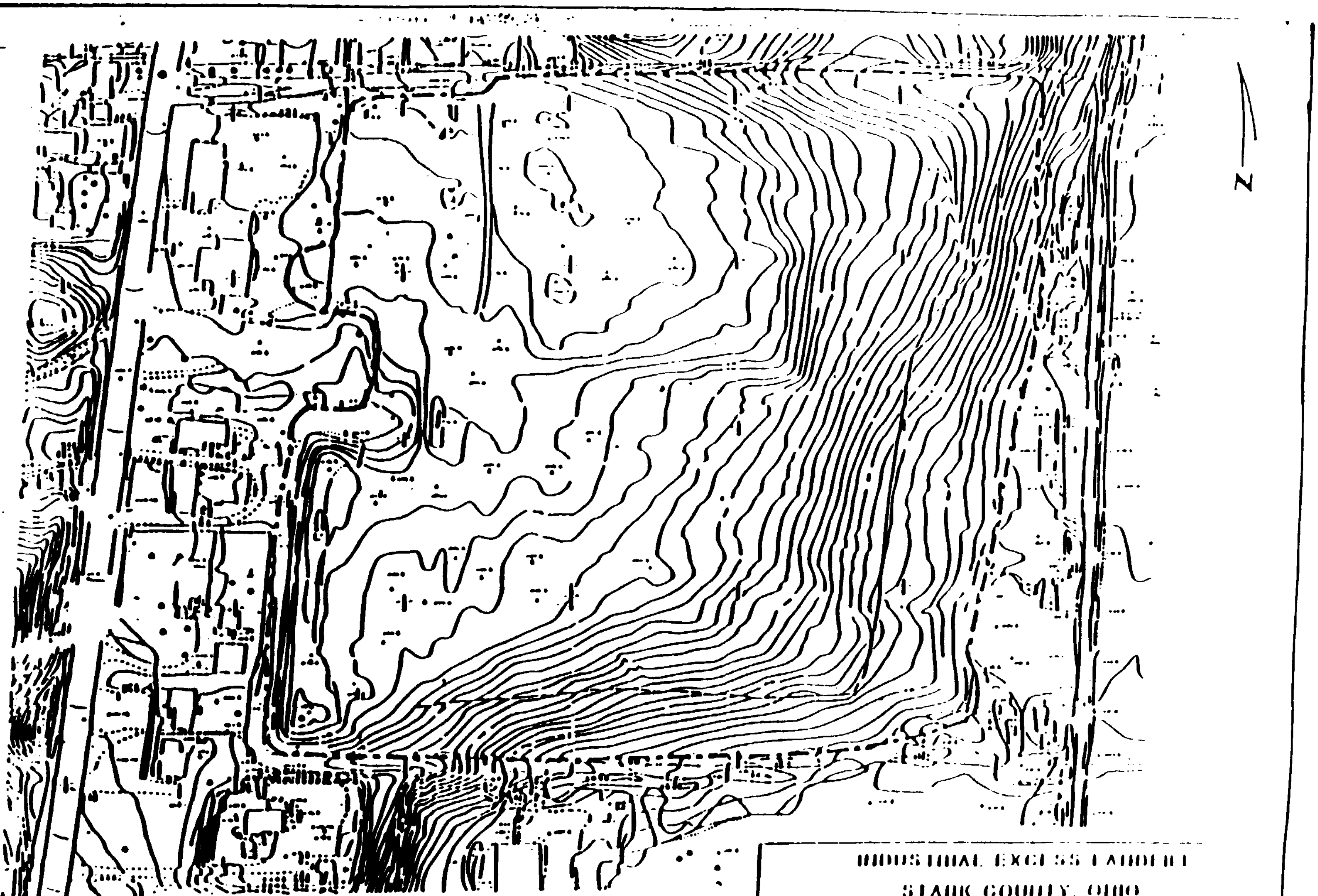
The Record of Decision (September 1987) for provision of alternate water to approximately 100 residences near the landfill will ensure safe drinking water is available to the community near the landfill before full implementation of the final remedial action.

V. Summary of Site Characteristics

A. Extent of Source:

Waste materials were disposed of throughout the entire area occupied by the landfill. Prior to the start of the RI, it was known that landfilling of household, commercial, and industrial wastes occurred over approximately 80 to 85 percent of the site property. Many of these industrial wastes are considered hazardous by current standards. Figure 3 shows the area of the landfill which is estimated to be underlain by buried wastes. At the IEL site, waste materials typically were buried immediately adjacent to the property line. During the installation of MVS monitoring wells, buried wastes also were noted in an off-site area behind the tire shop located close to the northwest corner of the site.

Due to the varying topography at the site, the depth of the fill ranges from approximately 60 feet at the northwest corner of the site to several feet along the south and east portions of the site. Wastes were not disposed in those areas where the water table was only several feet below the ground surface (the topographically low eastern portion of the



LEGEND

- - - - - APPROXIMATE LIMIT OF WASTE

INDUSTRIAL EXCESS LANDFILL
STARK COUNTY, OHIO

FIGURE 3

APPROXIMATE LIMIT OF WASTE

C.E. JOHNSON & MALHOTRA, P.C.

property).

Along with the landfilling of solid wastes, substantial quantities of liquid waste were dumped onto the ground either from 55-gallon drums or from tanker trucks. These liquids typically were mixed with flyash or dry refuse also disposed of at the site. Table 1 lists the chemicals known to be taken to IEL. Table 2 lists the chemicals found in samples from drums excavated during installation of the MVS. In addition, witnesses have described the disposal of what they believe had been solvents and industrial chemicals, which were volatile and/or had foul odors. According to a past employee, only those drums which could not be emptied of their contents were landfilled. Others were typically emptied and returned to the generator. While it is possible that liquid filled drums may have been disposed of at the landfill, the information provided by the past employee suggests that this would have been a rare occurrence.

B. RI Results:

The results of the RI conducted at the IEL site indicate the following:

- The most extensive body of contaminated materials consists of the wastes and waste-soil mixtures in the landfilled portions of the site. These waste materials were covered with clean soil during the site's closure.

- Sampling indicates that surface soil contamination on the site occurs at two small leachate seep areas. There was also an area just outside the site's property line which exhibited polycyclic aromatic hydrocarbons (PAHs). Clean soil materials, as placed on a portion of the site by U.S. EPA's Emergency Response Section following the installation of the MVS, covered this off-site PAH contaminated area.

- Off-site contaminant migration posing a threat to public health and the environment is associated with the groundwater.

Sampling of private residential and on-site/off-site monitoring wells has shown groundwater to be contaminated with volatile and semi-volatile organics and total metals. The most highly contaminated monitoring well exhibited a concentration of 400 ppb of assorted Hazardous Substance List (HSL) volatile and semi-volatile organic compounds and a total of 2,000 ppb of tentatively identified organic compounds (TICs). Compounds of greatest concern found in the monitoring wells include benzene and 1,2-dichloroethane. Vinyl chloride was found in three private wells located downgradient from the landfill. Barium levels also exceed the maximum contaminant level (MCL) as stipulated by the Federal Safe Drinking Water Act (SDWA). Nickel is present at higher than Ambient Water Quality Criteria (AWQC) levels in eight downgradient residential wells. The results from one sampling round showed elevated lead levels in some of the residential well samples. Data obtained from several

TABLE 1

LISTING OF SOLVENTS AND OTHER MATERIALS DISPOSED AT THE IEL SITE

Information obtained from PRPs

- acetone
- benzene
- n-butanol
- n-butyl acetate
- ethanol
- 2-ethoxyethyl acetate
- ethyl acetate
- gasoline
- hexane
- n-heptane
- isopropyl alcohol
- isopropyl acetate
- methanol
- 2-methoxyethanol
- 1,1,1-trichloroethane
- methyl ethyl ketone
- methyl isobutyl ketone
- methylene chloride
- monochlorobenzene
- naptha
- naptha (aliphatic)
- sulfuric acid
- tetrahydrofuran
- toluene
- xylene

previous and subsequent sampling events at these homes have not shown any evidence of elevated lead levels. Therefore, the set of analytical data exhibiting these elevated lead levels is considered to be an anomaly which is not truly representative of site conditions.

Groundwater contaminated with volatile and semi-volatile organic compounds and metals exists beneath and downgradient of the landfill. Based on monitoring and residential well sampling, this contamination has been shown to extend several hundred feet downgradient (west) of the site. Figure 4 shows the extent of inorganic and organic contamination plumes based on data from monitoring and residential wells. This sampling has also shown that the ground water contamination is presently confined to the shallow portions of the sand and gravel aquifer.

Organic and inorganic contaminated soils and sediments exist at scattered locations on the landfill property. The locations include two areas where leachate seeps have been noted and in the sediments of the on-site ponds.

Metzger Ditch flows southward along the east side of the landfill and continues southwest beyond the southern boundary of the site. Samples of surface water, sediment, and soil associated with Metzger Ditch indicate that site related contaminants have discharged into the ditch, but at concentrations detected to date which do not pose a risk to human health or the environment.

Contaminants of interest are the chemicals which have been detected in the site media and which can be associated with waste disposal activities at the site. Tables 3 through 5 summarize the concentrations of the contaminants of interest detected in soil, groundwater and landfill gas.

VI. <u>Summary of Site Risks</u>

As part of the RI at IEL, a Public Health Evaluation (PHE) was conducted to assess the potential impact on the public health and the environment from the release of hazardous substances from the site. As part of this process, quantitative risks assessments were made for the soils, groundwater, and air exposure pathways at the landfill.

The PHE notes the following contaminants of interest and respective media as possibly presenting an unacceptable risk at IEL, (where "unacceptable risk" is defined as a greater than 10^{-6} excess lifetime cancer risk or a hazard index for a critical effect subgroup exceeding one):

- o Under the assumed trespassing scenario, the upper bound excess lifetime cancer risks associated with soil contact (including ingestion) exceed the 10^{-6} level for children (2×10^{-6}) and adults (3×10^{-5}) under the plausible maximum case, but not for the average case. The risk in all cases is attributable

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TABLE 2

SUMMARY OF DRUM SAMPLING RESULTS - IEL

Organic Chemicals	Detected Range (ug/kg)	Frequency of Detection
1,1,1-Trichloroethane	1200 - 1700	3/24
1,1-Dichloroethane	230	1/24
2-Hexanone	6100	1/24
4-Methyl-2-Pentanone	1000 - 32,000	4/24
Acetone	5100 - 12,000	3/24
Benzene	2200 - 23,000	5/24
Chlorobenzene	1800 - 2300	2/24
Ethylbenzene	3900 - 1.3E7	8/24
Styrene	42,000 - 3,900,000	7/24
Tetrachloroethene	790 - 6200	6/24
Toluene	1000 - 1,100,000	11/24
Xylenes	1400 - 1.2E8	6/24
Trans-1,2-Dichloroethene	8700	1/24
Trichloroethene	1200 - 1400	3/24
1,2-Dichlorobenzene	41,000	1/24
1,4-Dichlorobenzene	11,000 - 15,000	3/24
2-Methylnaphthalene	2.4 - 3,200,000	3/24
2-Methylphenol	8300	1/24
4-Chloro-3-Methylphenol	2200 - 3200	2/24
l-Methylphenol	4900 - 43,000	3/24
enzoic Acid	34,000	1/24
is(2-Chloroethyl)Ether	19,000	1/24
is(2-Ethylhexyl)Phthalate	16,000	1/24
utylbenzyl Phthalate	2400 - 51,000	2/24
i-N-Butyl Phthalate	8700 - 62,000	2/24
i-N-Octyl Phthalate	4500 - 65,000	5/24
iMethyl Phthalate	150,000	1/24
-Nitrosodiphenylamine	2900 - 32,000	5/24
phthalene	2.1 - 2,500,000	5/24
ntachlorophenol	86,000 - 620,000	2/24
enol	6000 - 280,000	7/24
rene	1700 - 5900	2/24

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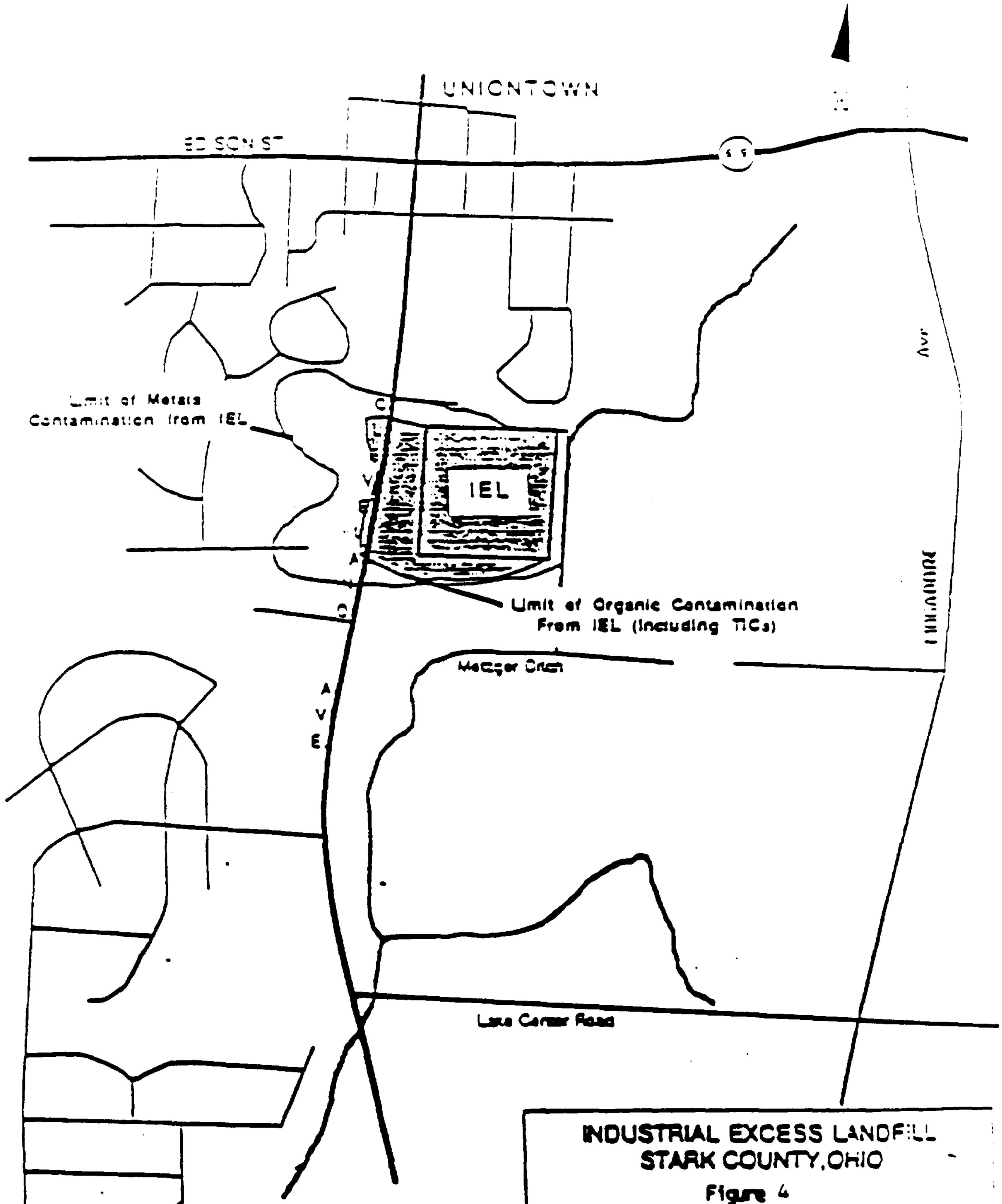

**INDUSTRIAL EXCESS LANDFILL
STARK COUNTY, OHIO**

Figure 4

PRESENT EXTENT OF GROUNDWATER CONTAMINATION AT IEL

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Scale Approximate, 1" = 1100'

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TABLE 3

ORGANIC CHEMICALS DETECTED IN SURFACE SOILS
INDUSTRIAL EXCESS LANDFILL SITE

Chemical	On Site Range[a] (ppb)	On Site Frequency[b] of Detection	Near Site & Down Gradient Range[a] (ppb)	Near Site & Down Gradient Frequency[b] of Detection	Off Site (Background) Range[a] (ppb)	Off Site (Background) Frequency[b] of Detection
1,4-Dichlorobenzene	43 (<330)	1/30	---	0/13	---	0/7
2-Butanone	<10-51	2/30	---	0/13	---	0/7
2-Methylnaphthalene	130-15,000	4/30	312-374	0/13	---	0/7
2-Methylphenol	190 (<330)	1/30	---	0/13	---	0/7
4,4-DDE	15-200	3/30	---	0/13	---	0/7
4,4-DDT	<16-170	3/30	<16-4,800	2/12	<16-220	1/7
4-Methyl-2-Pentanone	5 (<10)	1/30	---	0/13	---	0/7
4-Methylphenol	350-3,000	1/30	---	0/13	---	0/7
Acenaphthene	94 (<330)	1/30	---	0/13	---	0/7
Aldrin	<16-53	1/30	---	0/13	---	0/7
Anthracene	240-410	2/30	---	0/13	---	0/7
Benzene	2-9	2/30	---	0/13	---	0/7
Benzo(A)Anthracene	<350-1,100	1/30	---	0/13	---	0/7
Benzo(A)Pyrene	<350-900	1/30	---	0/13	---	0/7
Benzo(B)Fluoranthene	<350-1,400	1/30	---	0/13	---	0/7
Benzo(G,H,I)Perylene	<350-530	1/30	---	0/13	---	0/7
Benzo(K)Fluoranthene	<350-820	1/30	---	0/13	---	0/7
Benzoic Acid	117-122 (<400)	2/30	---	0/13	---	0/7
Bis(2-Ethylhexyl) Phthalate	110-600,000	6/30	505-754	4/13	---	0/7
Butylbenzylphthalate	60-2,100	3/30	---	0/13	12 (<330)	1/7
Chlordane	<25-280	1/30	---	0/13	---	0/7
Chlorobenzene	310	2/30	---	0/13	---	0/7

[a]<x - chemical not detected, where "x" is the detection limit. A number or range followed by a number in parentheses indicates detected values below the detection limit where the number in parentheses is the detection limit.

[b] - Frequency of detection is the number of samples in which the chemical was detected over the total number of samples analyzed.

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TABLE 3 (Continued)

ORGANIC CHEMICALS DETECTED IN SURFACE SOILS
INDUSTRIAL EXCESS LANDFILL SITE

Chemical	On Site		Near Site & Down Gradient		Off Site (Background)	
	Range[a] (ppb)	Frequency[b] of Detection	Range[a] (ppb)	Frequency[b] of Detection	Range[a] (ppb)	Frequency[b] of Detection
Chrysene	<400-4,700	3/30	---	0/13	---	0/7
Di-N-Butyl Phthalate	250 (<330)	1/30	268-2,255	4/13	110-290 (<330)	3/7
Di-N-Octyl Phthalate	330 (<330)	1/30	---	0/13	---	0/7
Dibenzofuran	44 (<330)	1/30	---	0/13	---	0/7
Diethyl Phthalate	46-50 (<330)	2/30	---	0/13	---	0/7
Ethylbenzene	3-900,000	9/30	---	0/13	---	0/7
Fluoranthene	49-12,000	4/30	260-280 (<330)	1/13	93 (<330)	1/7
Fluorene	15-73 (<330)	2/30	---	0/13	---	0/7
Gamma-BHC (Lindane)	<8.0-61	1/30	---	0/13	---	0/7
Indeno(1,2,3-CD) Pyrene	<330-700	1/30	---	0/13	---	0/7
N-Nitrosodiphenylamine	120-4,300	7/30	---	0/13	---	0/7
Naphthalene	30-1,800	4/30	---	0/13	---	0/7
PCBs	59-320	3/30	---	0/13	---	0/7
PCB-1016						
PCB-1212						
PCB-1248						
PCB-1254						
Phenanthrene	210-6,600	5/30	47-291	2/13	---	0/7
Phenol	94-590	2/30	---	0/13	---	0/7
Pyrene	<330-8,400	2/30	80-380	2/13	110 (<330)	1/7
Tetrachloroethene	<5-8	1/30	---	0/13	---	0/7
Toluene	3-20	4/30	<5-810	7/13	---	0/7
Total Xylenes	<5-13,000	8/30	<5-5	1/13	---	0/7
Trichloroethene	<5-16	1/30	<5-8	1/13	---	0/7

[a] <x = chemical not detected, where "x" is the detection limit. A number or range followed by a number in parentheses indicates detected values below the detection limit where the number in parentheses is the detection limit.

[b] = Frequency of detection is the number of samples in which the chemical was detected over the total number of samples analyzed.

TABLE 3 (Continued)

ORGANIC CHEMICALS OF INTEREST DETECTED IN SURFACE SOILS
INDUSTRIAL EXCESS LANDFILL SITE

Chemical	On Site: Range[a] (ppm)	On Site: Frequency[b] of Detection	Near Site & Down Gradient: Range[a] (ppm)	Near Site & Down Gradient: Frequency[b] of Detection	Off Site (Background): Range[a] (ppm)	Off Site (Background): Frequency[b] of Detection
Antimony	---	0/30	<7.8-78.6	2/13	---	0/7
Arsenic	3.8-35	27/30	5.1-167	13/13	6.96-34	6/7
Barium	19-547	25/30	64-200	12/13	19-162	7/7
Beryllium	0.20-0.9	11/30	0.2-3.7	8/13	0.4-1.5 (<1.5)	3/7
Cadmium	<1.9-13.3	7/30	<0.67-9.4	8/13	<0.2-5.2	4/7
Chromium	4.1-53	23/30	<4.4-148	11/13	8-23	6/7
Cobalt	3.8-22	16/30	2.5-20	10/13	7.4-17	3/7
Copper	0.3-55	24/30	<5.6-135	12/13	8.25-36	6/7
Lead	<2.2-699	27/30	4.6-203	12/13	11-349	7/7
Manganese	29-1,560	29/30	233-1,900	10/13	242-1,540	7/7
Mercury	<0.041-0.23	10/30	<0.1-0.65	5/13	<0.05-0.2	2/7
Nickel	<6.1-48	21/30	7.4-36	11/13	<12 54	3/7
Selenium	---	0/30	<0.08-1.1	1/13	0.2 (<2.7)	1/7
Silver	1.8-3.5	4/30	<1.3-8.3	3/13	<1.3-3.5	1/7
Thallium	<1.1-2.1	2/30	0.23-0.60	6/13	0.26-0.35 (<1.3)	1/7
Tin	<5.2-50	3/30	NS	---	---	0/7
Vanadium	8.3-30	15/30	7.2-62	10/13	7.6-20 (<23)	6/7
Zinc	<3.5-1,960	29/30	15-362	13/13	46.9-107	7/7
Cyanide	0.95-22.1	5/30	<0.3-42	6/13	<0.36-1.3	1/7

[a] <x = chemical not detected, where "x" is the detection limit. A number or range followed by a number in parentheses indicates detected values below the detection limit where the number in parentheses is the detection limit.

[b] = Frequency of detection is the number of samples in which the chemical was detected over the total number of samples analyzed.

NS = not sampled.

TABLE

HSL CONTAMINANTS OF INTEREST DETECTED IN GROUNDWATER - IEL

CONSTITUENT	CONCENTRATION RANGE (ppb)
Monitoring Wells	
Acenapthene	2
Benzene	1.2 - 10
Butylbenzylphthalate	1 - 6
Benzoic Acid	9
Chlorobenzene	<5 - 27
4-Chloro-3-Methylphenol	1 - 5.2
1,2-Dichloroethane	<5 - 10
1,1-Dichloroethane	<5 - 25
1,4-Dichlorobenzene	10 - 13
2,4-Dimethylphenol	3
Di-n-Octylphthalate	1
Ethylbenzene	<5 - 110
2-Methylnapthalene	2.7 - 3.0
4-Methylphenol	3
n-Nitrosodiphenylamine	<10 - 15
Napthalene	7.9 - 10
Phenol	3.7
Trans-1,2-Dichloroethene	3.8 - 4.3
Toluene	0.9 - 13
Total Xylenes	<5 - 355
Barium	75 - 1,430
Cadmium (Total)	21
Copper (Total)	<19 - 575

TABLE 4 (Continued)

HSL CONTAMINANTS OF INTEREST DETECTED IN GROUNDWATER - IEL

CONSTITUENT	CONCENTRATION RANGE (ppb)
Monitoring Wells	
Chromium (Elemental)	5 - 9.2
Lead (Total)	<3 - 11
Manganese	39 - 3,060
Nickel (Total)	<14 - 48
Selenium (Total)	<3 - 6.8
Vanadium	3.1 - 17

CONSTITUENT	CONCENTRATION RANGE (ppb)
Residential Wells	
Chloroethane	1.0 - 2.0
Tetrachloroethene	1 - 1.3
Vinyl Chloride	1.5 - 7
Barium	2.1 - 1,370
Cobalt	<5 - 16
Cadmium (Total)	0.1 - 0.58

TABLE 4 (Continued)

HSL CONTAMINANTS OF INTEREST DETECTED IN GROUNDWATER - IEL

CONSTITUENT	CONCENTRATION RANGE (ppb)
Residential Wells	
Chromium (Elemental)	<5 - 11
Cyanide (Total)	<2.3 - 25
Copper (Total)	<4 - 356
Lead (Total)	<1 - 15.5
Nickel (Total)	<7 - 48
Silver	0.4 - 12
Selenium (Total)	<2 - 20
Vanadium	<5 - 22
Zinc (Total)	<8 - 733

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TABLE 5

CONTAMINANTS OF INTEREST DETECTED IN EXTRACTION SYSTEM GAS SAMPLES FROM THE INDUSTRIAL EXCESS METHANE VENTING SYSTEM

Compound	Tenax Collection	Summa Canister
Vinyl Chloride	ND 1/	6.7 ppm
1,1-Dichloroethylene	>14 ppb 1/	
trans 1,2-Dichloroethene	ND	
1,1-Dichloroethane	630 ppb 2/	
1,2-Dichloroethane	ND	
Benzene	2200 ppb 2/	
Trichloroethylene	280 ppb 2/	
Toluene	1500 ppb 2/	
Tetrachloroethylene	300 ppb 2/	
Ethyl Benzene	1200 ppb 2/	
Xylenes	1860 ppb 2/	
Styrene	65 ppb	
m-Ethyl Toluene	73 ppb 3/	
C3 Alkyl Benzene	400 ppb 3/	
Methylene Chloride	Det.	
1,1,1-Trichloroethane	Det.	
Chlorobenzene	Det.	
C5 Hydrocarbons	310 ppb 3/	
C6 Hydrocarbons	14 ppm 3/	
C7 Hydrocarbons	8.9 ppm 3/	
C8 Hydrocarbons	8.0 ppm 3/	
C9 Hydrocarbons	3.3 ppm 3/	
C10 Hydrocarbons	1.9 ppm 3/	

TABLE 5 (Continued)

CONTAMINANTS OF INTEREST DETECTED IN EXTRACTION
SYSTEM GAS SAMPLES FROM THE INDUSTRIAL
EXCESS METHANE VENTING SYSTEM

Compound	Tenax Collection	Summa Canister
Methane		20%
Ethane		60 ppm
Propane		4.4 ppm
Propylene		10 ppm
Radon		516 picocuries/liter

Notes: Anal. 1 - GC/MS Analysis of Tenax Portion of collected tubes.
Anal. 2 - Analyses of Summa Canister.

1/ Either not detected in analysis or reported concentration biased low due to breakthrough of target compound to non-analyzed CMS portion of tube.

2/ Compound signal greater than the range of the instrument calibration.

3/ Reported values are sums of all measured concentrations of individual compounds belonging to the specific family of chemical compounds.

Det. - Compound detected but not quantified because of either interferences in its spectra or no calibration curve for the compound.

to carcinogenic PAHs which were found in surface soil samples outside the site boundary. It does not appear that these contaminants are related to waste disposal activities at the site. This area is presently covered with clean fill which mitigates the threat to public health from direct contact. For noncarcinogenic effects, hazard indices are all less than one, for both on-site soils and off-site soil analyzed.

- Long-term (lifetime) consumption of groundwater containing maximum measured levels of landfill-derived carcinogens exceeds the 10^{-6} risk level. The risks are associated with 1,2-dichloroethane (3×10^{-5}), benzene (1×10^{-5}), tetrachloroethane (4×10^{-6}), and vinyl chloride (5×10^{-4}). Two year exposure hazard indices for children exceed one for critical effects subgroups for combined concentrations of barium and zinc, and lead and manganese.

- Upper bound excess lifetime cancer risk from exposure to contaminants in air, based on the modeling of emissions from the landfill flare to the nearest house, are above the 10^{-6} level for both children (3×10^{-6}) and adults (6×10^{-6}). Virtually all of the risk is associated with the presence of 1,1-dichloroethene (up to 5×10^{-6} risk alone) and 1,2-dichloroethane (up to 2×10^{-6} risk alone).

Table 6 summarizes the contaminants of interest that exceed allowable exposure based on the risk assessment.

With regard to the risks associated with the air contaminants discussed above, it should be noted that the data used for this assessment was obtained during the direct and downwind sampling of the plume produced by a candle flare which was initially installed at the site. This flare has since been replaced with a ground flare which is expected to achieve an increased destruction of the chlorinated organics responsible for the calculated upper bound cancer risk levels. Sampling data obtained subsequent to replacement of the candle flare has shown undetected contaminants in the exhaust gases of the ground flare.

VII. Description of Alternatives

Based on information gathered during the remedial investigation, it was determined that the remedial alternatives considered should address two major areas of concern: 1) the landfill waste/soil mixtures, coupled with the resulting landfill gas production; and 2) the contaminated groundwater.

During the FS, numerous technologies were identified and evaluated to address the problems at IEL. Applicable technologies were screened in more detail to limit the number to be retained for detailed evaluation. The technologies retained for the areas of concern at IEL are presented

TABLE 6

CONTAMINANTS OF INTEREST
THAT EXCEED ALLOWABLE EXPOSURES
BASED ON THE RISK ASSESSMENT

Soils/Waste

Carcinogenic PAHs

Groundwater

1,2-Dichloroethane
Benzene
Tetrachloroethene
Vinyl Chloride
Barium
Nickel

Air

1,1-Dichloroethene
1,2-Dichloroethane

below:

Media/Area	Technology
Contaminated Ground water	Extraction; Air Stripping; Precipitation/Flocculation/Sedimentation; Filtration; Carbon Adsorption; Discharge to Metzger Ditch
Landfill Gas	Active Collection and Flaring
Waste/soil mixture	Capping

All waste/soil mixture treatment technologies were eliminated before the detailed evaluation portion of the FS. The treatment technologies were not practicable to implement because of the large volume (2 million cubic yards) of heterogenous waste, the lack of "hot spots" of concentrated contamination, and the difficulty, risk, and cost associated with conducting a treatment operation. As with nearly every landfill site on the NPL, containment was found to be the most effective technology for the waste/soil mixture.

Three alternatives were evaluated in the detailed evaluation portion of the FS and are briefly described below.

A. Alternative 1 - No Action:

The only response actions associated with the No Action alternative are the installation of a fence to restrict site access; institutional controls; and continual monitoring. No further corrective actions would be taken at the site. Operation and maintenance on the existing methane venting system (MVS) would be continued by OEPA. the proposed alternate water system would be implemented as planned, and the in-home air strippers would remain in place until the water system is on line. Operation and maintenance would consist of routine monitoring in order to assess changes in the location and concentration of the contaminant plume.

Construction Cost: $88,000
Annual O & M: $94,000
Total Present Worth: $864,000
Time to implement: 3 months

B. Alternative 2A - RCRA Cap, Expanded MVS, Ground water Pump & Treat:

The major components of this alternative are: Fence, institutional controls, monitoring, RCRA cap, expanded MVS, groundwater collection, treatment, and discharge to Metzger Ditch.

A fence would be installed to restrict site access. A multilayer cap would be placed over the site to prevent direct contact with waste materials, and prevent infiltration of surface water into contaminated materials. The cap would be constructed in accordance with RCRA regulation and guidance, and seeded following construction. Institutional controls would be imposed to restrict future use of the site property. For example, the site could not be used as a park, or for any type of construction. Upon completion of the remedy, the site would essentially appear as it does now, a large grassy field.

The existing methane venting system (MVS) would be expanded to accommodate increased potential for lateral landfill gas migration due to the cap.

Groundwater would be collected by a number of extraction wells. The collected water would be treated, as necessary, by air stripping, carbon adsorption and flocculation/ sedimentation/filtration to achieve compliance with the Clean Water Act discharge criteria. The groundwater collection system would remove the contaminant plume. Indirect containment would be achieved by lowering the water table, thereby preventing contact between groundwater and landfill waste materials. Preventing infiltration by capping the site should result in a lowering of the groundwater table. In order to protect groundwater from additional contamination by the landfill, perpetual groundwater extraction to maintain a depressed water table may be necessary. Groundwater treatment would continue only as long as necessary to attain discharge criteria as required by the Clean Water Act. The criteria are developed during design and are based on specific site characteristics such as influent concentrations, location of discharge point, volume and flow of water in Metzger Ditch, usage of Metzger Ditch, relationship to other surface water bodies, etc. These criteria may or may not be less stringent than Safe Drinking Water Act criteria, and the possibility exists that the extracted groundwater will not need to be treated or will only be treated for a limited period of time.

As stated above, the purpose of installing a cap over the landfill is to prevent surface water from coming into contact with buried wastes. Because wastes were dumped right up to the edge of IEL's property lines, the proposed cap will have to extend beyond the perimeter of the site in order to be fully effective. Based on the conceptual cap design, U.S. EPA will need at least fifty feet of land adjacent to the northern, western and southern boundaries of the landfill. U.S. EPA may need additional footage to ensure continued access to the cap over the long term. In addition, U.S. EPA proposes to use land along Cleveland Avenue as a staging area for construction activities and for a water treatment facility. Current projections indicate that the following properties would be needed: the staging area would comprise six properties along Cleveland Avenue - a vacant lot, four occupied residences, and one vacant real estate office (See Figure 5). Other properties necessary for the construction of the cap and future access include three residences and one vacant lot immediately adjacent to the site along Hilltop Avenue, one residence adjacent to the northwest corner of the site, two businesses immediately west of the site on Cleveland Avenue,

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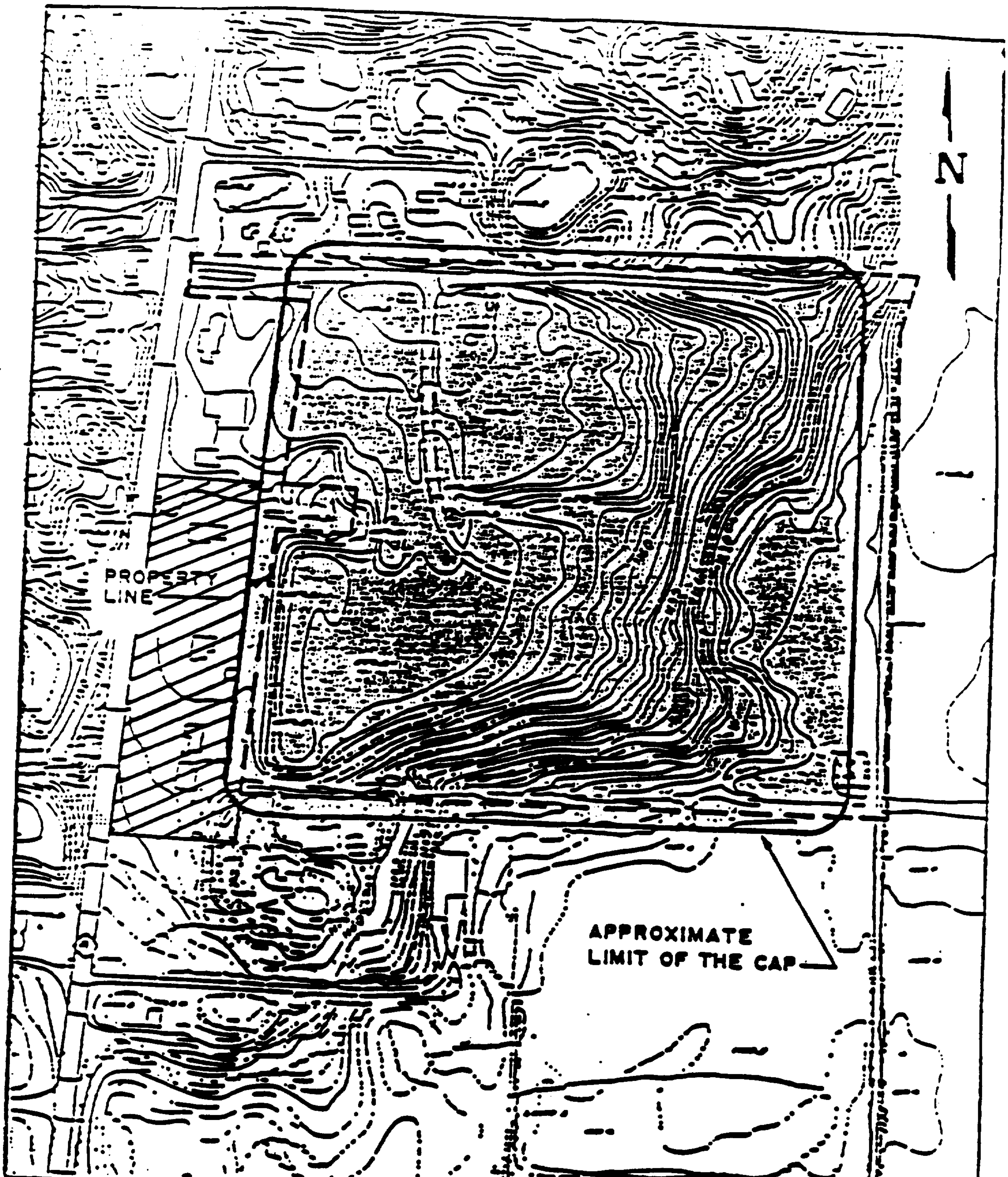

SCALE 1" = 300'	REM II INDUSTRIAL EXCESS LANDFILL STARK COUNTY, OHIO	FIGURE 5
DATE OCT. 1988		

the home at the southwest corner of the site, two residences and two vacant lots immediately adjacent to the site along Amber Circle, and the property adjacent to the southern site boundary. U.S. EPA will use the conceptual design estimates to proceed with the necessary land acquisition immediately.

Land acquisition at IEL will be handled in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act, 42 U.S.C. 4601 et seq., and corresponding regulations (40 CFR Part 4). The Uniform Act is designed (1) to ensure that citizens whose land is needed for a federal project are justly compensated; and (2) to enable those homeowners and businesses who are forced to move to relocate with as little hardship as possible. In those cases where the Agency needs only a portion of a landowner's property and the owner will be left with "an uneconomic remnant," the Agency will offer to acquire the entire property. 42 U.S.C. §4651(9). The Uniform Act defines an uneconomic remnant as "a parcel of real property in which the owner is left with an interest after the partial acquisition of the owner's property and which the head of the Federal agency concerned has determined has little or no value or utility to the owner." U.S. EPA has determined that the following properties will be left with an uneconomic remnant: one residence at the northwest corner of the landfill, three residences and one vacant lot adjacent to the landfill along Hilltop Ave., 2 businesses adjacent to the landfill along Cleveland Ave., and one residence at the southwest corner of the landfill. The details of property acquisition will be worked out with individual owners on a case-by-case basis. Where an uneconomic remnant will result from the Agency's acquisition, some owners may nevertheless prefer to sell only that portion of their property required for the landfill cap, while others may elect to sell their entire property.

Operation and maintenance will include regular inspection of the cap for signs of settling, damage due to burrowing animals, deep-rooted plants, etc., and any necessary repairs. Periodic fertilization and mowing of the vegetative cover will be required. Continual operation and monitoring of the ground water extraction system will include equipment maintenance, sludge removal, replacement of spent carbon, and sampling and analysis of effluent. The performance of the MVS will be monitored through routine sampling of gas monitoring wells. Regular inspections will be conducted and equipment will be replaced as necessary.

Construction Cost: $14,957,000
Annual O & M: $440,000
Total Present Worth: $18,548,000
Time to implement: 12 - 18 months

C. **Alternative 2B - RCRA Cap with Retaining Wall, Expanded MVS, Groundwater Pump & Treat**

The major components of this alternative are: Fence, institutional

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controls, monitoring, RCRA cap with retaining wall, expanded MVS, groundwater collection, treatment and discharge to Metzger Ditch.

The components of this alternative are identical to those of Alternative 2A, excepting the addition of a retaining wall to the cap design, which would reduce the amount of adjacent land required for implementation. There are no functional differences between the alternative. The retaining wall would be used to limit the extent of the cap along all of the western and portions of the northern and southern boundaries of the site. The retaining wall would be 6 to 8 feet in height and designed to contain the material comprising the RCRA cap. This alternative would require the acquisition of approximately 25 feet of the properties adjoining the portion of the site with the retaining wall. Approximately 50 feet would be required of the properties immediately north and south of the site which are not adjacent to the retaining wall. The staging area and water treatment facility would be located in the same location and require the same property acquisition as described in Alternative 2A (see Figure 5).

Operation and maintenance for this alternative would be similar to that which was described in Alternative 2A. Additional maintenance would be required for the retaining wall.

Construction Cost: $15,845,000
Annual O & M: $462,000
Total Present Worth: $19,644,000
Time to implement: 12-18 months

VIII. Summary of Comparative Analysis of Alternatives

The three alternatives carried through to the detailed evaluation portion of the FS were evaluated against the nine criteria listed below:

1. <u>Overall Protection of Human Health and the Environment</u> addresses whether or not a remedy adequately eliminates existing or potential risks, and describes how risks are eliminated, reduced through treatment; engineering controls, or institutional controls.

2. <u>Compliance with ARARs</u> addresses whether or not a remedy will meet all of the applicable or relevant and appropriate requirements (ARARs) of other environmental statutes and/or provide grounds for invoking a waiver.

3. <u>Long-term effectiveness and permanence</u> refers to the ability of a remedy to maintain reliable protection of human health and the environment over time, once the remedial goals have been met.

4. <u>Reduction of toxicity, mobility, or volume</u> evaluates the anticipated performance of the treatment technologies a remedy may employ.

5. <u>Short-term effectiveness</u> involves the period of time needed to

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achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until remedial goals are achieved.

6. Implementability is the technical and administrative feasibility of a remedy, including the availability of goods and services needed to implement the chosen solution.

7. Cost includes capital and operation and maintenance (O&M) costs.

8. Support Agency Acceptance indicates whether, based on its review of the remedy, the support agency (CEPA) concurs, opposes, or has no comment on the Record of Decision.

9. Community Acceptance are assessed in the Responsiveness Summary of this Record of Decision.

Each of the three alternatives was evaluated against the nine criteria and then compared to one another. A tabular summary of the comparison is presented in Table 7 and a narrative summary is presented below:

* Overall Protection of Human Health and the Environment: Alternative 2A and 2B are protective of human health and the environment, by extracting and treating contaminated groundwater and landfill gas, and by containing the landfill wastes. The no action alternative allows for continued infiltration of surface water into the waste and continued contamination of groundwater from the wastes.

* Compliance with ARARs: Alternatives 2A and 2B comply with identified ARARs. The no action alternative does not comply with ARARs and does not qualify for a statutory ARAR waiver.

* Long-term Effectiveness and Permanence: Alternatives 2A and 2B provide long-term effectiveness through a well designed and operated and maintained containment system. The water table level will be lowered because infiltration of surface water will be minimized. In addition, in order to protect groundwater from any additional contamination by the landfill, the groundwater will be pumped to lower further the water table. The expanded MVS system will control landfill gas and increase the effectiveness of the cap. Long term operation, maintenance, and monitoring is required for Alternatives 2A and 2B. The groundwater treatment system provides the only permanence associated with these alternatives. The no action alternative is not effective in the long-term and has no permanent components.

* Reduction of Toxicity, Mobility, or Volume: The principal component of alternative 2A and 2B is containment, with elements of treatment. These alternatives

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TABLE 7

COMPARATIVE SUMMARY OF REMEDIAL ALTERNATIVES

Evaluation Criteria	ALTERNATIVE 1 No Action	ALTERNATIVE 2 w/Cap Option 1 without Wall	ALTERNATIVE 2 w/Cap Option 2 with Wall
Short-term Effectiveness	Not effective	Provides short-term effectiveness	Provides short-term effectiveness
Long-term Effectiveness	Not effective	Provides long-term effectiveness	Provides long-term effectiveness
Reduction of toxicity, mobility and volume (TMV)	No reduction in TMV except for the partial destrution of landfill gases by the existing MVS and flaring.	The flaring of landfill gases provides a reduction of toxicity, mobility, and volume for the gaseous media.	The flaring of landfill gases provides a reduction of toxicity, mobility, and volume for the gaseous media.
Implementability	Not applicable	Implementable, but requires land acquisition.	Land acquisition requirements are less than those for Option 1.
Cost (a)	$864,000	$18,548,000	$19,644,000
Compliance with ARARs	Does not attain ARARs existing conditions are not altered.	Complies with ARARs	Complies with ARARs
Overall Protection of Human Health and the Environment	Results in unacceptable health risks which exceeds 10^{-6}	Provides overall protection of human health and the environment.	Provides overall protection of human health and the environment.
State Acceptance	Does not accept	Accepts	Accepts
Community Acceptance	Does not accept	Very limited acceptance	Very limited acceptance

provide no treatment to reduce the toxicity, mobility or volume of contaminants associated with the landfill waste material. Alternatives 2A and 2B utilize treatment to reduce the toxicity, mobility and volume of contaminants in the landfill gas through the continual operation of the MVS, which effectively destroys gaseous contaminants via combustion. The mobility of contaminants in ground water is reduced by extraction and treatment. Volume and toxicity of contaminants are reduced, to a lesser degree, through the regeneration of spent carbon used in the treatment of groundwater. The no action alternative provides no reduction in the toxicity, mobility, or volume of contaminants.

* Short-term Effectiveness: The time to implement Alternatives 2A and 2B is 12 - 18 months. Increased volume of construction traffic will present some short term risks to the community, as will the excavation of landfill material necessary to expand the existing MVS. Construction of the containment system and water treatment facility will present little risk to the community. It is estimated that extraction and treatment of the existing groundwater contamination will take approximately 3 years. Thereafter, the pumping of groundwater may need to continue indefinitely in order to protect groundwater from additional contamination by the landfill. The no action alternative takes only 3 months to implement and has no additional short-term risks.

* Implementability: All components of Alternatives 2A and 2B are proven technologies which are widely used and easily implementable. Delays due to technical difficulties are not likely. However, administrative delays are possible, with regard to the acquisition of privately owned property. The no action alternative presents no implementability problems.

* Cost: Alternative 2A is less expensive than Alternative 2B. The no action alternative is the least costly as it requires only fencing, monitoring, and operation of the existing MVS.

* State Acceptance: The State of Ohio concurs with the selected remedy. No action is not acceptable to the State.

* Community Acceptance: The community's comments are summarized and responded to in the Responsiveness Summary.

IX. Selected Remedy

A: Remedy

Based on the evaluation of the alternatives, U.S. EPA selects Alternative 2A - fence, use restrictions, RCRA cap, expanded MVS, ground water extraction and treatment, and in order to protect groundwater from additional contamination by the landfill, continual groundwater pumping to maintain lowered water table - as the remedy for the IEL Site. The selected remedy is protective of human health and the environment, attains ARARs, and provides the best balance among the nine evaluation criteria. By containing the source area to prevent further groundwater contamination, extracting and treating already contaminated groundwater, and extracting and flaring landfill gas, the selected remedy reduces the risk posed by the landfill to an acceptable level. In combination with the alternate water supply operable unit, the selected remedy eliminates the threat of exposure to contaminated groundwater. The chemical specific ARARs and TBCs must be attained in the groundwater beneath the IEL site and at all points beyond the site where contaminated groundwater has migrated. Landfill gas concentrations beyond the site boundary shall not exceed 5 percent methane. The cleanup levels and performance standards to be achieved by the selected remedy are presented in Section IX(B).

B. Detailed Remedy and Design Phase Studies Descriptions:

The following is a detailed description of the selected remedy and the minimim design studies necessary to collect information for design of the various remedy components. Detailed work plans will be developed for the design studies to be conducted.

1) The Groundwater Component:

The two main objectives of the groundwater pump and treat component of the remedy is to:

- o Maintain a lowered water table in order to protect groundwater from additional contamination by the landfill,
- o Ensure that the existing contaminated groundwater within, beneath, and off the site is intercepted, before it has a chance to move downgradient, and extracted. Extracted groundwater will be treated to meet discharge criteria.

As mentioned in the RI Report, the water levels in installed monitoring wells indicate a mounding of groundwater within the landfill. This situation is most likely due to the accumulation of precipitation which has percolated through the permeable soil materials used to cover the site. As a result, portions of the wastes and contaminated soil in the landfill are likely saturated with groundwater. To alleviate this situation, A RCRA cap will be installed to prevent surface water infiltration and, in order to protect groundwater from additional contamination by the landfill, groundwater extraction wells will be installed to further lower the water table beneath the landfill. As a result, there will be reduced contact between the wastes/contaminated soils and groundwater.

a) <u>Groundwater Extraction</u>

The conceptual strategy for groundwater extraction was developed using site specific information from the Remedial Investigation (RI) Report. During the RI, hydrogeologic characteristics were determined from rising head tests, water level measurements and logs from monitoring well borings.

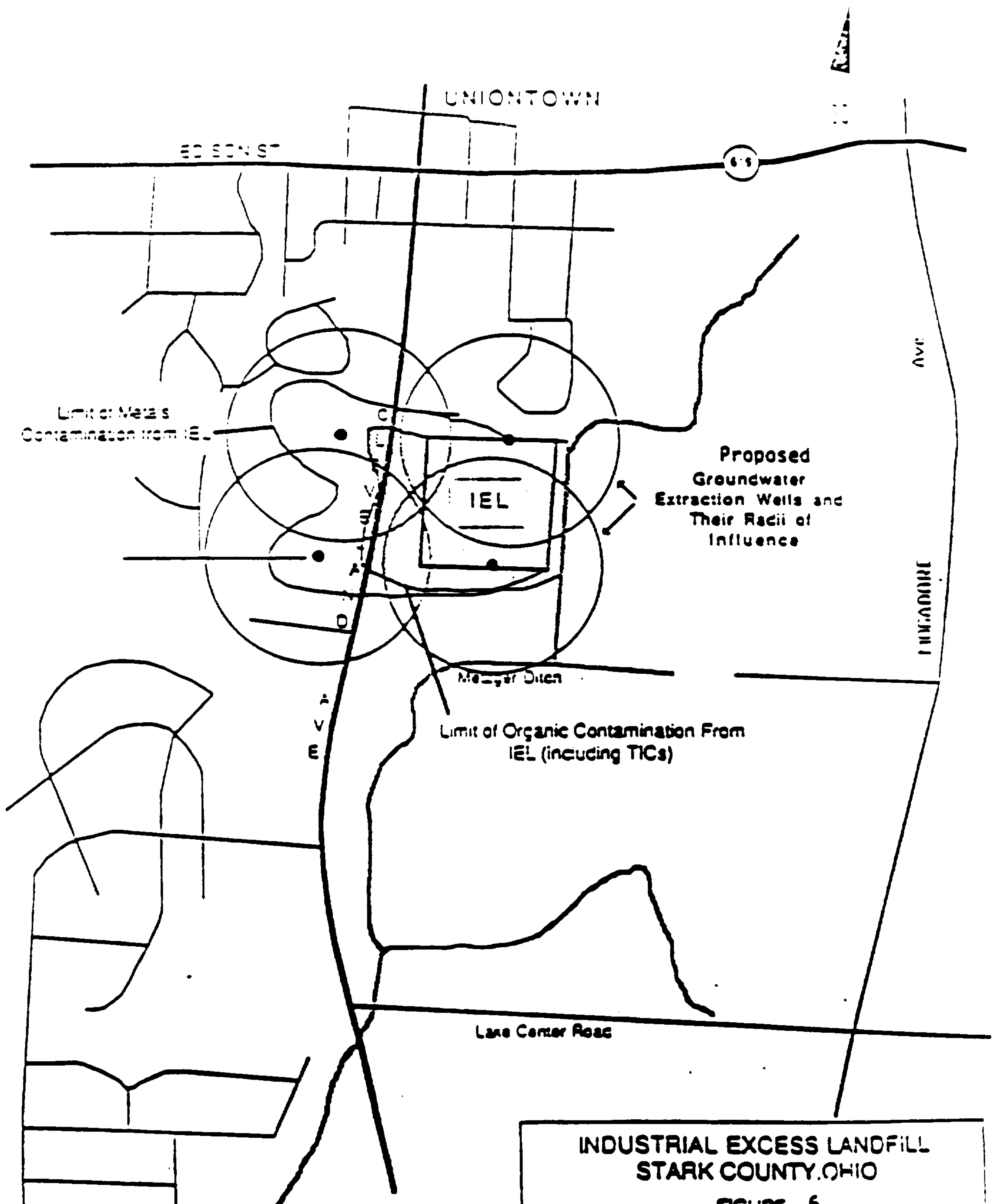
Extraction rates are based on equilibrium flow conditions in an unconfined (water table) aquifer. Steady state conditions were used since pumping is expected to be steady and continuous. The objective was to design a well system that will be effective over the entire zone of contamination while still minimizing the total quantity of water needing to be extracted. The throughput rate at which the water can be economically treated was also considered. The conceptual system used for cost estimating purposes consists of four extraction wells located on and around the landfill as shown on Figure 6. Each well will be pumped at a rate of approximately 400 gallons per minute.

Contamination was found in the shallow monitoring wells, with the wells located closest to the actual landfill waste (MW01S, MW03S, MW04S, MW04S, MW05S, and MW07S) showing the most contamination. In addition residential wells RW05, RW38, RW39, RW07, RW08, RW09, RW40, and RW11 also exhibited various levels of contamination. The shallow monitoring wells were screened at 5 to 42 feet below the surface of the ground. Figure 7 shows the locations of all groundwater samples taken at the site. This includes installed monitoring wells, the residential wells sampled, and two existing irrigation wells (located due east of the landfill) used as monitoring wells. At the IEL site, large variations in surface elevation and the depth to the water table exists, varying from a few feet to approximately 45 feet below the ground surface.

Assuming that all groundwater less than 40 feet below the surface of the water table is contaminated, the bottom of the extraction well screen will be set at a maximum depth of approximately 85 feet.

Utilizing the previously stated assumptions, the volume of contaminated groundwater was calculated to be approximately 256 million gallons. For the purpose of estimating the duration of treatment, it is assumed that three pore volumes of water (768 million gallons) will have to be extracted to reduce contamination in the aquifer to drinking water criteria.

Based on a total pumping rate of 1,600 gpm and a total volume of 768 million gallons, the duration of pumping is estimated to be 3 years. However, in order to maintain the lowered water table, pumping may continue indefinitely, but at least as long as necessary to protect groundwater from additional contamination by the landfill. Treatment of these extracted groundwaters will be necessary until the discharge concentrations meet NPDES



INDUSTRIAL EXCESS LANDFILL
STARK COUNTY, OHIO

FIGURE 6

Groundwater Extraction Wells and Their Radii of Influence

C.C. JOHNSON & MALHOTRA, P.C.

Scale Approximate: 1" = 1100'

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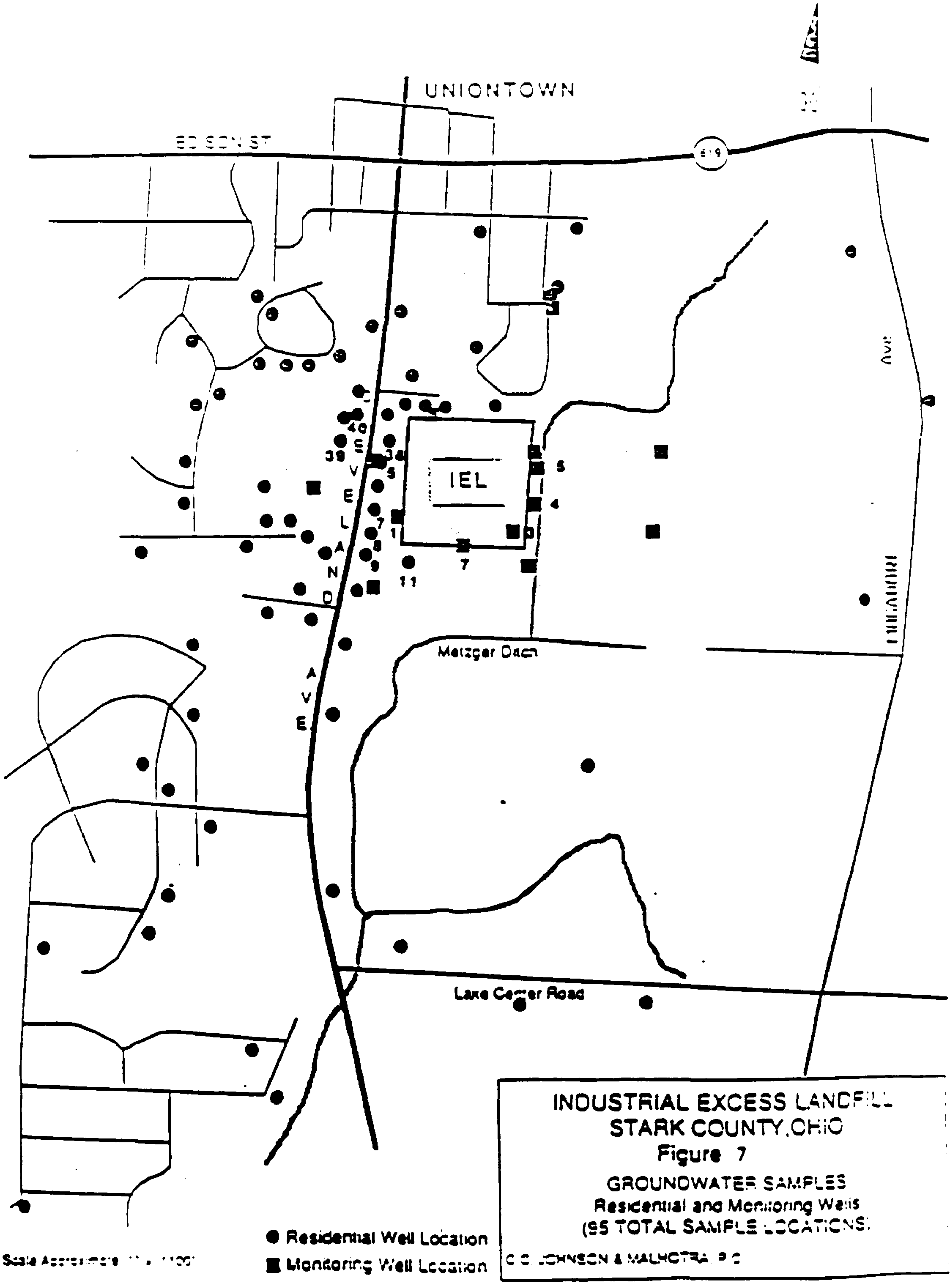

INDUSTRIAL EXCESS LANDFILL
STARK COUNTY, OHIO
Figure 7
GROUNDWATER SAMPLES
Residential and Monitoring Wells
(95 TOTAL SAMPLE LOCATIONS)
C.C. JOHNSON & MALHOTRA, P.C.

requirements.

The following presents a preliminary recommendation for a monitoring program which may be implemented at the IEL site: eight wells (five shallow, three deep) would be installed downgradient (west) of the landfill and four (two shallow, one deep and one intermediate) installed upgradient (east) of the site. In addition, wells should be installed both to the north (two shallow and one deep) and the south (two shallow and one deep) of the landfill. The exact number and location of these wells will be determined as the initial wells are installed. The depth of these wells will be dependent upon their location. Shallow wells should be installed at the top of the water table with deep wells installed in bedrock.

The new monitoring wells will be installed to serve multiple purposes. The exact location of these wells will be selected to assist in further defining the specific areal and vertical extent of groundwater contamination at the IEL site. They will also be located to provide additional definition of the "mound" at IEL. Water level elevation measurements obtained from the array of existing and newly installed monitoring wells will be used to provide information concerning flow interactions between Metzger Ditch and local/regional groundwater.

These wells will also serve to define the eastern extent of potentially contaminated groundwater flowing from the mound before changing direction and becoming part of the western regional flow. The new and the existing monitoring wells will be sampled and analyzed to further define the groundwater characteristics at and around IEL. The exact location of the new wells and the monitoring program will be determined during the RD phase. At this time the sampling and analysis of groundwater are assumed to be performed on a quarterly basis druing the first 5 years and semiannually thereafter. Samples would be analyzed for the full CLP RAS organic and inorganic compound list in the beginning of the program and for compounds of concern later on. Conventional parameters shuch as chloride, sulfate, nitrate, nitrite, specific conductivity, and alkalinity will also be determined. Radiological scans will be conducted in accordance with the Safe Drinking Water Act (i.e. Gross Alpha and Gross Beta) and Analytical Labs will be requested to tentatively identify compounds. Water levels of the monitoring wells would be taken at the time of sampling and hydraulic gradients would be calculated and compared to existing data.

The extraction well system conceptual design is based on a number of assumptions. During design, a more complete evaluation of the hydrogeologic characteristics of the site and surrounding area will be conducted. During the RD phase, pump tests and computer modeling will be necessary to design the optimum extraction system.

At least two such tests will be conducted, one to the north and one to the south of the landfill. In the performance of the pumping tests, piezometer wells will be installed and monitored to evaluate the drawdown resulting from various pumping scenarios. These piezometers will also serve to establish water levels and assist in the definition of groundwater flow north, east and south of the site ("the mound" and the affects of Metzger Ditch). This testing program used in conjunction with data from the monitoring well program will determine the ultimate location of the extraction wells. The information collected during the design may indicate modification of the conceptual design is necessary. Such modifications may affect the number, location, and pumping rate of the groundwater wells and the number of pore volumes of water to be removed in order to achieve cleanup levels.

The capital/construction costs for the conceptual groundwater extraction system are estimated to be $925,430. The annual O&M costs for this system are estimated to be $154,034. Present worth costs, based on a 10% discount rate, and carried over a three year period (the estimated duration of groundwater treatment activities), are estimated to be $550,710.

b) Groundwater Treatment

The groundwater will be treated to NPDES effluent discharge standards established for Metzger Ditch. The treatment system would consist of a countercurrent, packed stripping column, activated charcoal and flocculation, sedimentation and filtration. The treated effluent will then be pumped and discharged into Metzger Ditch. If treatment is not necessary, it will not be provided. Contaminant concentrations in extracted groundwater may be below NPDES effluent discharge standards allowing for direct discharge to Metzgers Ditch without treatment.

Flocculation, Sedimentation Filtration - Flocculation/sedimentation/filtration are combined with air stripping and carbon adsorption to treat the inorganic contaminants of concern (e.g. barium and nickel) as well as other metals that may be present. Flocculation and sedimentatiaon will be used to remove these compounds. Lime will be used as a coagulant because it is able to achieve 88 to 95 percent removal of all of these compounds. The additon of lime would raise the pH to between 8 and 9 causing dissolved metals to form insoluble metal hydroxides. With the aid of polymer, insoluble constituents of the waste stream will aggregate and settle in the settling tank. The treated water will be filtered to remove residual floc, and acid will be added to readjust the pH. Sulfuric acid was used to calculate the cost of pH adjustment. To reduce pressure loss through the filter, it must be periodically backwashed. This backwash from filtration would be recycled through the treatment system. The effluent from the neutralization tank will then be pumped to the air stripper and

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granular activated carbon unit to remove VOCs.

The other effluent stream for this treatment system is sludge from the sedimentation process. A plate and frame filter press will used to dewater this sludge. This sludge, which will likely contain elevated concentrations of barium, nickel and other metals may be considered a hazardous waste. As such, it must be managed as a hazardous waste (i.e., solidified prior to disposal in an approved, RCRA compliant landfill). The liquid filtrate from this process will be recycled through the treatment system.

Air Stripper - A pre-designed, portable package-type air stripping unit, available from several vendors, will be utilized to treat the groundwater. Based on a flow rate of 1600 gpm, an air stripper 5 feet in diameter containing 20 feet of packing material (1.5 inch polypropylene rings) will be required. This configuration assumes an air to water ratio of 30:1. The air stripper will be constructed of Fiberglass reinforced plastic and can be placed onsite on a concrete pad.

Following installation, groundwater will be pumped to the top of the air stripping column at a rate of approximately 1600 gpm where the influent water will spread thinly over the plastic packing media in the column as it falls. Air blown upwards through the packing removes the VOCs from the water by mass transfer. The discharges from the air stripper shall comply with Federal and State regulations and requirements.

Mass balance analysis of air and water flows will be used to monitor the air stripper's performance and efficiency. The results of these analyses would be used to adjust air to water ratios.

Following the air stripper the groundwater will pass through a granular activated carbon adsorption (GAC) unit.

Granulated Activated Charcoal - The GAC adsorption system would be a package unit consisting of two two-in-series 10 feet diameter carbon columns operated in parallel. Each vessel will contain approximately 20,000 lbs. of carbon and will operate at an individual flow rate of 800 gpm (1,600 gpm overall) in series configuration. When the carbon has reached its capacity for effective contaminant removal (breakthrough) in the lead column, that column will be refilled with virgin or regenerated carbon. Effluent from the second carbon column will be discharged to the Metzger Ditch along the eastern boundary of the site. Through the use of the two two-in-series units greater flexibility and performance capabilities are possible.

The exhausted carbon will be returned to the vendor supplying the carbon for regeneration. The carbon can be regenerated if PCBs, dioxin or dibromochloropropane are not present in the contaminated

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carbon. IEL's groundwater does not contain any of these contaminants. Therefore, regeneration will be possible. The treated groundwater will than be discharged to the Metzger Ditch.

c) Groundwater Disposal

The treated groundwater effluent will be pumped from the onsite treatment system to the Metzger Ditch which flows along the eastern portion of the landfill. Water will be conveyed to the ditch through approximately 600 feet of ten-inch diameter ductile iron pipe. The effluent will be continually monitored to ensure compliance with NPDES discharge criteria for Metzger Ditch.

The Metzger ditch flows through two counties, Stark County and Summit County, and ultimately flows into the Tuscarawas River. The portion of the ditch within the Stark County boundary was last dredged in 1975 to facilitate drainage of the surrounding farm lands and residential property.

The ditch was constructed to handle a maximum flow rate of approximately 100 ft ^{3}/sec. In Summit County, it is estimated that the ditch is able to handle similar flow rates. The effect of a 1,600 gpm discharge from the water treatment system to the Metzger Ditch should be minimal even if 50 percent deterioration of the ditch capacity is assumed. The Tuscarawas River is the discharge point of the Metzger Ditch. The river is designated a warm water aquatic life habitat and is mainly utilized for agricultural, industrial and recreational activities.

The system will be required to meet the National Pollutant Discharge Elimination System (NPDES) requirements for surface discharge. Daily collection of effluent samples and flow measurements will be required to ensure compliance with these requirements. Sampling and flow monitoring will be the responsibility of the treatment system operating personnel.

d) Groundwater Monitoring

Groundwater monitoring will be required during and after the implementation of each of the remedial alternatives. Monitoring will help determine the effectiveness of the remedy and ensure that further migration is not occurring. Installation of additional monitoring wells will be required at the IEL site. Compliance monitoring to determine when groundwater cleanup levels have been achieved shall be conducted at points beneath the landfill and along the contaminant plume extending from the landfill to off-site areas. The exact number and location of these wells will be determined during performance of the design study. A monitoring program will be developed to check the effectiveness of the cleanup and to determine if adjustments to the extraction system are necessary. The monitoring frequency and analytical parameters will be determined based on the system design to ensure adequate information is collected.

2) The Soil/Waste Component

This remedy requires the installation of a RCRA cap over the surface of the landfill. In order to maintain the appropriate side slopes, this design requires substantial intrusion onto the adjacent property.

RCRA Cap

Installation of the cap will involve the excavation and removal of the highest areas, filling in the low lying areas with landfill surface materials (including wastes) removed during grading/excavation operations, grading the area, and then capping. Following excavation/filling the site will be graded and the operation begun.

Capping techniques are used when materials are to be buried or left in place. These techniques are particularly applicable when the waste is an extensive subsurface deposit and excavation and removal are not practicable. Multilayer caps are preferred, especially in the midwest where swelling and shrinking of the clay layer is a problem. The synthetic layer helps to prevent excessive swelling shrinking of the clay layer. The IEL cap design will appropriate site specific factors into account, including erosion, water balance, settling, and permeability.

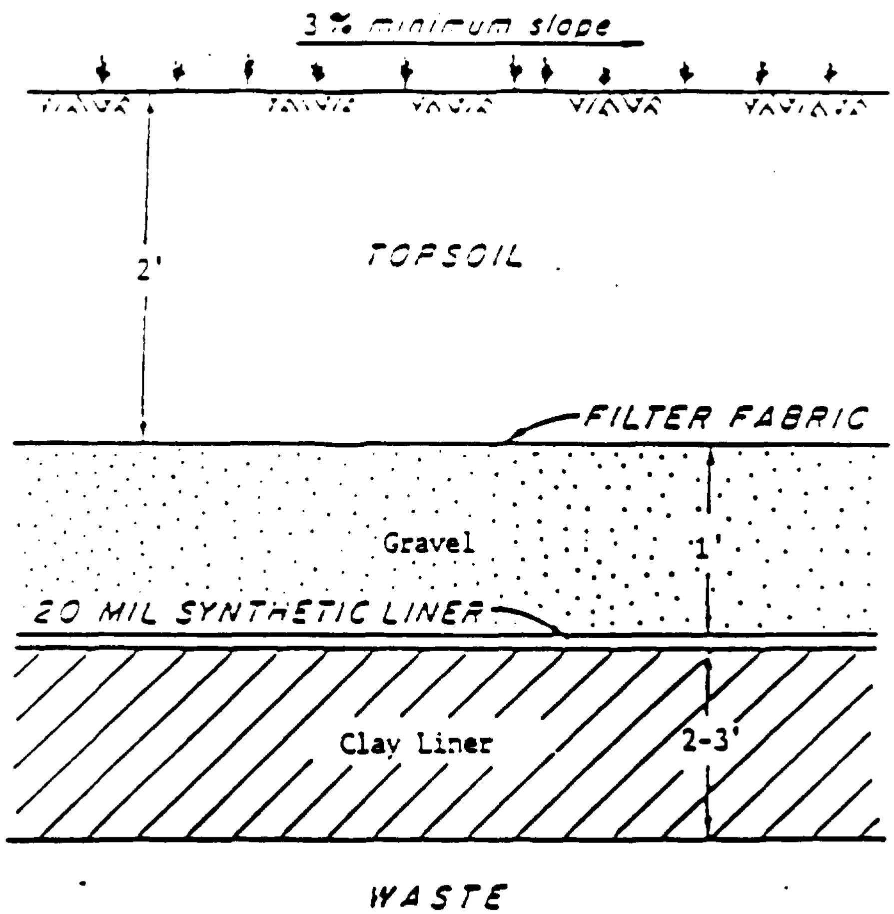
Capping of the contaminated area presently calls for the construction of a three-layered cap conforming to RCRA guidelines (See Figure 8). The area to be capped is outlined on Figure 5 and encompasses approximately 30.0 acres. This operation will first consist of the placement of a two to three foot clay liner, compacted in six inch lifts. A twenty-mil synthetic liner will then be placed over the clay. Next, a one-foot thick drainage layer of gravel will be spread and overlain with geotextile fabric. The geotextile fabric will maintain the drainage layer and help to stabilize a final layer of two feet of top soil by keeping fine top soil particles from filling the pore space of the gravel layer. The top soil will be vegetated to prevent erosion. A drainage channel will be constructed to direct surface run-off to the present site drainage (Metzger ditch).

Precipitation that percolates through the top soil will flow laterally through the gravel and over the impermeable synthetic and clay barrier and into the drainage channels.

While constructing the cap, provision will be made to retain the present MVS, and extend it as described later in this ROD.

FIGURE 8

TYPICAL CROSS-SECTION OF A CAP



The engineering considerations for a cap include:

- o Determination of total area to be covered by defining the vertical and horizontal boundaries of the waste to be capped
- o Determination of the volume of material required for cut/fill
- o Design and construction of the cap to prevent erosion or subsidence as per RCRA guidelines/standards
- o Site preparation to achieve required slopes
- o Location of a collection system for stabilization of cap surface water run-off before being discharged
- o Extension of the present Methane Venting System.

The major construction equipment required for the implementation of this alternative include:

- o Bulldozer
- o Hydraulic excavator
- o Front end loader
- o Dump trucks
- o Compactor
- o Hydroseeding equipment

Due to the presence of very marshy and peaty conditions along the eastern portion of IEL (along Metzger Ditch), the soil may require stabilization for heavy equipment to work.

The cap will be inspected on a regular basis for signs of erosion, settlement, or subsidence. It is recommended that inspections be conducted frequently in the first six months because problems are most likely to appear during this period. Maintenance of the final cap would include application of fertilizer and periodic mowing to prevent invasion by deep rooted vegetation. Any signs of unexpected settling or subsidence should be addressed immediately by removing the overburden and repairing the affected areas.

Air monitoring will be required during construction to ensure that a safe working environment is maintained and that no threat to public health or the environment is created by air emissions from the site during construction.

It may be necessary to install a clay liner which is thicker than that usually recommended for a RCRA cap. The additional clay will be designed to provide extra coverage for the manifold piping if the design of the extended MVS call for the piping to be below the cap.

3) The Air/Gaseous Emission Component

The remedy calls for installing active gas extraction wells at selected locations at the landfill. The number and locations of wells to be installed within the landfill will be determined as a result of gas extraction tests conducted during the RD phase. The extraction wells will be connected using a head/manifold piping system which will ultimately end up at the blowerhouse and ground flare. Thus, this extended methane venting system (EMVS) will be interconnected with the MVS currently in place.

The purpose of these wells will be to: 1) relieve gas pressures within the landfill, and 2) extract methane and other volatile gases emanating from within the landfill and to direct these gases so that they do not migrate offsite.

During the RD phase gas extraction tests will be performed at the IEL site. These tests should consist of several installed extraction wells and corresponding gas monitoring probes. The exact number and location of these extraction wells will be determined prior to initiation of this program. At this time, U.S. EPA estimates that at least three such extraction test wells will be installed at IEL. Around each test extraction well, at least five pressure probe nests (3 wells each) will be installed. These nests will be located to measure pressure changes (as well as static pressure) throughout the depth of the landfill.

These tests will be used in a model to determine the existing gas pressure within the landfill (static pressure) and to design the MVS at IEL. The objective of the tests is to ensure that the MVS will be adequate in capacity and location to prevent migration of the landfill gasses from the site. The system will also be designed to ensure the integrity of the RCRA cap, (e.g., problems due to pressure build-ups). It is important to realize that to achieve both of these objectives the pressure beneath the cover needs to be slightly higher than atmospheric to prevent the flow of oxygen and nitrogen into the landfill. The MVS system must also be designed to ensure that this pressure differential is maintained without excessive buildup. The existing MVS monitoring well system will be expanded as part of the design of the overall MVS.

It will also be necessary during these tests to collect additional gas samples to define the specific gas characteristics to ensure

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the designed system will be effective in the collection and treatment of these gases. During the drilling of the on-site groundwater monitoring wells, gas samples will be collected at various depths within the landfill ranging from the surface to maximum depth of waste disposal or to groundwater, whichever is encountered first. These samples will be analyzed for HSL compounds, Radon, and will be screened for gross radiation. Additional radioactive isotopes will be analyzed in the event the gross screening indicates the potential presence of radioactive elements. In the course of implementation of this system, ambient air monitoring will be conducted as necessary.

4) Surface Water/Sediment Component

Surface waters contained in the ponds at IEL will be pumped to the groundwater treatment system as necessary to meet NPDES discharge criteria for Metzger Ditch. With the removal of the free water above the sediments in the on-site ponds, these materials will be dredged from the ponds and incorporated into the soil/waste mixture for additional remediation. As necessary, these materials will be dewatered.

As necessary, the sediments from Metzger Ditch will be dredged and incorporated with the dredged pond sediments. Proper controls will be exercised to minimize potential risks of releases from these operations. An initial part or these monitoring efforts will be the core sampling of sediments in Metzger Ditch adjacent to the site to ensure RD/RA activities do not adversely impact the ditch, and to refine previous data on contaminant movement into the ditch. Core samples will be analyzed for HSL organic and inorganic compounds as determined in the sampling plan.

Monitoring of Metzger Ditch and all surface water discharges from site operations during remediation will be performed and remedial actions taken as necessary.

5) Land Requirements

Additional land will be required during implementation of the remedial action at the IEL site. A staging area will be needed in order to accommodate the large equipment which will be used during site remediation. Land will also be needed for construction of the groundwater treatment plant. Figure 9 shows the location of the land that needs to be obtained in order to effect the remedial action at the site. In addition, approximately 50 feet along the north, south and western boundaries of the site are necessary for construction of the RCRA cap at 4:1 side slope, drainage ditches, roadways and fencing as required to implement this alternative. U.S. EPA will use the conceptual design estimates to proceed with the land acquisition immediately after issuance of this ROD.

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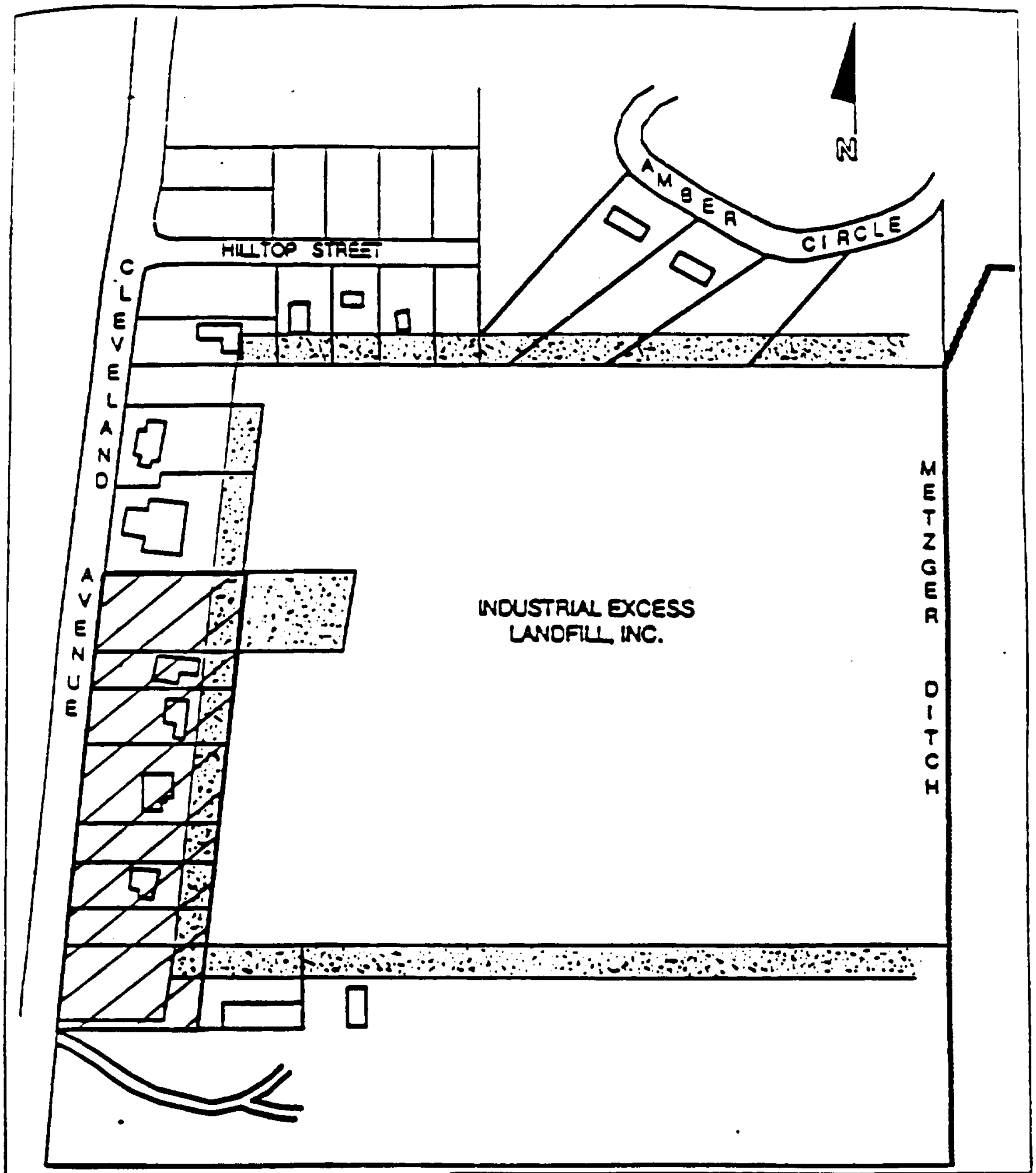

Approximate area of cap beyond IEL site

Area for staging & treatment plant

Scale Approximate, 1" = 280'

INDUSTRIAL EXCESS LANDFILL
STARK COUNTY, OHIO

FIGURE 9

C. Community Participation During RD/RA

The community group at IEL, Concerned Citizens of Lake Township (CCLT), has requested U.S. EPA to provide a mechanism for meaningful community input during the IEL remedial design and implementation. U.S. EPA will form a Technical Advisory Committee (TAC) made up of CCLT representatives, other community members, local officials, Ohio EPA representatives and U.S. EPA representatives. Providing the TAC member's stipulation to confidentiality and commitment to a schedule, U.S. EPA will provide the TAC members the opportunity to review and comment on draft design and other technical documents generated during the IEL RD/RA. The TAC will hold regular meetings to review the progress of the RD/RA and to discuss technical issues. All TAC comments on draft documents will be submitted to U.S. EPA. U.S. EPA will consider all comments received, but retains final decision authority on the content of all documents. The Community Relations Plan for RD/RA will be amended to reflect this agreed upon level of community participation.

X. Documentation of Significant Changes

A. RCRA Cap

The containment portion of the preferred alternative described the conceptual design of a RCRA multilayer cap consisting (from bottom to top) of:

- clay liner
- 20 ml synthetic liner
- sand drainage layer
- filter fabric
- top soil and vegetation

Several public comments were submitted to U.S. EPA regarding the multilayer cap's integrity in light of differential settling within the landfill. The comment noted that differential settling may cause cracks to form in the clay liner and rupturing of the synthetic liner. As a result of this comment, U.S. EPA is clarifying the containment portion of the preferred alternative to provide assurance that all appropriate site specific factors will be considered during the design of the RCRA cap, including settling, erosion, water balance, and permeability.

B. Groundwater Extraction and Treatment System and Design Studies

The FS and Proposed Plan described the conceptual design of a groundwater extraction and treatment system. The conceptual design is based on currently available information. The FS and Proposed Plan also outlined the type of design study necessary to collect information to design the extraction and treatment system. U.S. EPA is modifying the ROD to clarify that the conceptual design of the extraction and treatment system may need to be modified based on information collected during the design study. Such modifications may affect the number, location, and pumping rates of the extraction wells. In addition, other extraction methods, such as trenches or french drains may be used in conjunction with extraction wells. The design study will examine hydrogeologic conditions within, beneath and near the landfill and whether NAPLs are present. U.S. EPA believes this clarification is necessary to provide enough flexibility to design the most efficient and effective extraction and treatment system.

C. Groundwater Extraction

The FS presented a groundwater extraction scenario which called for perpetual pumping in order to maintain a lowered water table level. However, if the RCRA cap is effective in preventing and reducing the infiltration into the site, the groundwater level may be lowered without the need for pumping or with only minimal pumping. In addition, as a result of the groundwater design study, U.S. EPA may be able to design an extraction and treatment system that provides for cleanup of that portion of the landfill which may remain in the groundwater after the cap is installed. U.S. EPA is modifying the remedy to clarify that pumping of groundwater to lower the water table will be conducted in order to protect groundwater from additional contamination by the landfill. This length of time may be less than perpetuity. If the extraction system is terminated, it will be started again should contaminant levels indicate groundwater quality may be compromised. This clarification is necessary to provide for cessation to groundwater pumping in the future if circumstances warrant it.

D. Land Acquisition

U.S. EPA is modifying the IEL remedy to clarify when the necessay land acquisition shall commence. U.S. EPA is confident that at least 50 feet of the properties on the northern, southern, and western borders of the site must be acquired to install an effective RCRA cap and that six complete properties adjacent to the western boundary must be acquired for a staging area and to construct a groundwater treatment plant. Accordingly, U.S. EPA will begin the acquisition procedures immediately after the ROD is issued and the State of Ohio has given assurances that it will accept transfer of the property following completion of the remedial action in accordance with Section 104(j)(2) of CERCLA.

In those cases where the Agency needs only a portion of a landowner's property and the owner will be left with "an uneconomic remnant," the Agency will offer to acquire the entire property. 42 U.S.C. §4651(9). The Uniform Act defines an uneconomic remnant as "a parcel of real property in which the owner is left with an interest after the partial acquisition of the owner's property and which the head of the Federal agency concerned has determined has little or no value or utility to the

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owner." U.S. EPA has determined that the following properties will be left with an uneconomic remnant: one residence at the northwest corner of the landfill, three residences and one vacant lot adjacent to the landfill along Hilltop Ave., 2 businesses adjacent to the landfill along Cleveland Ave., and one residence at the southwest corner of the landfill. The details of property acquisition will be worked out with individual owners on a case-by-case basis. Where an uneconomic remnant will result from the Agency's acquisition, some owners may nevertheless prefer to sell only that portion of their property required for the landfill cap, while others may elect to sell their entire property.

All other portions of the Proposed Plan are incorporated into this Record of Decision without significant change.

XI. Statutory Determinations

The selected remedy is protective of human health and the environment; attains ARARs; is cost effective, and utilizes permanent solutions and alternative treatment technologies or resource recovery to the maximum extent practicable. The selected remedy does not use treatment that reduces the toxicity, mobility, or volume of the source of contaminants as a principal element, however it does use treatment to address other principal threats, contaminated groundwater and landfill gas.

The following is a summary of how the selected remedy meets or addresses each of the five (5) statutory requirements:

A. Protection of Human Health and the Environment: The selected remedy will protect human health and the environment by a combination of engineered containment, treatment, and institutional controls. The IEL site is a source of ground water contamination. Drinking water wells down gradient from the landfill are contaminated with vinyl chloride, low levels of organic solvents, and/or metals. Landfill gas generated within the site contains volatile organic compounds. The selected remedy will contain the wastes at the site and reduce significantly the infiltration of surface water into the waste. The existing methane venting system will be expanded to ensure landfill gas is collected and prevented from building up beneath the RCRA cap. Existing contaminated groundwater will be extracted and treated in an on-site treatment plant. In order to protect groundwater from contamination by the landfill, the groundwater beneath the site may need to be pumped continually to maintain the water table beneath the bottom of the site wastes. Land use restrictions will be imposed on the site to prevent incompatible future use of the property. The selected remedy does not pose unacceptable short-term risks and will not cause cross-media contamination.

B. Attainment of the Applicable or Relevant and Appropriate Requirements: The selected remedy will attain Federal and State ARARs in accordance with Section 121(d)(1) of CERCLA. In addition, the selected remedy will proceed in accordance with certain Federal and State environmental criteria, guidance or policy to be considered (TBCs).

Applicable requirements are cleanup standards, standards of control, and other substantive environmental protection requirements, criteria or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance at a site. A requirement is "applicable" if the remedial action or circumstances at the site satisfy all of the jurisdictional prerequisites of the requirement.

Relevant and appropriate requirements are cleanup standards, standards of control, and other environmental protection requirements, criteria or limitations promulgated under Federal or State law that, while not legally "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance at a site, address problems or situations sufficiently similar to those encountered at the site that their use is well suited to that site.

"A requirement that is judged to be relevant and appropriate must be complied with to the same degree as if it were applicable. However there is more discretion in this determination: it is possible for only part of a requirement to be considered relevant and appropriate, the rest being dismissed if judged not to be relevant and appropriate in a given case." (Interim Guidance on Compliance with Applicable or Relevant and Appropriate Requirements, 52 FR 32496 (August 27, 1987).

While non-promulgated advisories, guidance documents or proposed rules issued by Federal or State governments do not have the status of potential ARARs, they may be considered in determining the necessary level of cleanup for protection of human health and the environment. (Interim Guidance on Compliance with Applicable or Relevant and Appropriate Requirements, 52 FR 32496 (August 27, 1987).

The following listing of ARARs and TBCs is divided into three broad categories: those relating to specific chemicals, those relating to specific actions, and those relating to the location of the site. As new standards are promulgated, the remedy will be reviewed and the cleanup level may need to be adjusted to ensure protection of public health.

1. Chemical Specific ARARs and TBCs Groundwater

   a) MCLs for the following compounds [Relevant and Appropriate]

Maximum Contaminant Levels (MCLs) are established under the Safe Drinking Water Act. These are the maximum contaminant concentrations allowed in regulated public water supplies. Levels are based on a chemical's toxicity, treatability, (including cost consideration), and analytical limits of detection.

MCLs are "relevant" to the remedial action at the IEL site because groundwater at the site is or may be used for drinking water. MCLs are "appropriate" because they set enforceable drinking water standards for public water supplies. As MCLs apply to water at its point of distribution ("at the tap"), these levels are appropriate for groundwater at this site because residential wells that might use the aquifers underlying the site generally have minimal or no treatment. Thus, these standards will have to be applied in the groundwater itself to ensure safe levels at the tap.

Compound	Concentration ug/l
*Vinyl chloride	2
*1,2-Dichloroethane	5
*Benzene	5
1,4-Dichlorobenzene	75
Barium	1000
Chromium	50
Lead	50
Arsenic	50
Cadmium	10
Selenium	10
Silver	50
Copper	1000 (secondary MCL)
Iron	300 (secondary MCL)
Manganese	50 (secondary MCL)
Zinc	5000 (secondary MCL)

   b) Proposed MCLs for the following compounds [To Be Considered]

Proposed MCLs for into the "To Be Considered" category because, until adopted, they do not constitute promulgated standards. Nevertheless, the Agency intends to meet and/or consider the proposed standards for the following compounds.

Compound	Concentration ug/l
Toluene	2000
*Tetrachloroethene	5

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Chlorobenzene	100
Ethylbenzene	700
Xylenes	10000
Barium	5000
Chromium	100
Lead	5
Arsenic	30
Cadmium	5
Selenium	50

c) Ambient Quality Criteria Adjusted for Drinking Water [To Be Considered]

Ambient Water Quality Criteria for Human Health (WQC) are established under the Clean Water Act. The original WQC assumed that people drank contaminated surface water and ate contaminated fish that lived in that water. The Superfund program adapted these criteria to groundwater by calculating the corresponding contaminant concentration for exposure to contaminated drinking water alone. (Superfund Public Health Evaluation Manual, October 1986).

Compound	Concentration ug/l
Nickel	15.4
Cyanide	200

d) 1×10^{-6} cumulative cancer risk based on the summation of the cancer risk from all carcinogenic compounds of concern. [To Be Considered]

In accordance with the Superfund Public Health Evaluation Manual, carcinogenic risks are additive. When a mixture of carcinogenic compounds is found at a site, reduction in the concentrations of those compounds to a level whereby the sum of the carcinogenic risk is 1×10^{-6} is necessary to protect public health. The compounds above marked with an asterisk are known or suspected carcinogens (arsenic is a known carcinogen but shall not be included in the calculation because the levels at the site are considered to be naturally occurring) and, in accordance with the SPHEM methodology for risk calculations, the risk from the sum of the concentrations of these compounds should not exceed 1×10^{-6}.

2. Action Specific ARARs and TBCs

Landfill Cap

a) RCRA Section 3004, 40 CFR 264 and 265, Subpart N. Establishes technical requirements for landfill closure,

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including cap specifications, sloping, surface drainage etc. [Relevant and Appropriate]

b) Ohio Air Pollution Control Standards, OAC 3745-15 through, 3745-25. Requires control of fugitive dust emissions. [Applicable]

Methane Venting System Expansion

a) Ohio Air Pollution Control Standards, OAC 3745-15 through 3745-25. Requires the use of Best Available Technology to control new sources of air pollution. [Applicable]

b) National Ambient Air Quality Standards, 40 CFR 50 - 3 hour average for hydro-carbons is 0.160 mg/m^3. [Relevant and Appropriate]

c) RCRA Section 4004 Criteria. Requires methane concentrations at compliance wells (at boundary of landfill) to be 5 percent by volume or less. [To Be Considered]

Ground Water Extraction and Treatment

a) NPDES discharge limitations Clean Water Act Section 402 40 CFR 122, 123, 125 and Subchapter N. Regulates discharge of water into public water. Includes contaminated groundwater pumped, treated, and discharged to surface water. Permit limits shall be established in accordance with the Ohio EPA Aquatic Life Water Quality Criteria applicable to Metzgers Ditch. Table 8 presents the criteria to be used for establishing NPDES discharge limitations. [Applicable]

b) RCRA Subtitle C, 40 CFR 260. Regulates the generation, transport, storage, treatment, and disposal of hazardous waste in the course of remedial action. Any spent carbon and/or sludge from the on-site treatment plant considered to be a hazardous waste must be managed in accordance with RCRA. [Relevant and Appropriate]

c) RCRA Section 3003, 40 CFR 262 and 263, 40 CFR 170 to 179. Regulating the transport of hazardous waste. Any spent carbon and/or sludge from the on-site treatment plant considered to be a hazardous waste must be transported in accordance with RCRA transportation regulations. [Applicable]

d) RCRA Section 3004(d) and (e). RCRA Land disposal restrictions. Any spent carbon or sludge from the treatment plant considered to be a land ban regulated

TABLE 8

OHIO EPA AQUATIC LIFE WATER QUALITY CRITERIA
(all concentrations in ug/l)

Compound	AAC*	CAC**
Acenaphthene	67	67
Acetone	550,000	78,000
Acrylonitrile	460	430
Aniline	10	0.44
Antimony	650	190
Arsenic	360	190
Benzene	1,100	560
Bis(2-ethylhexyl)phthalate	1,100	8.4
Bromoform	1,500	[illegible]
2-Butanone	160,000	7,100
Butyl benzyl phthalate	230	49
Carbon tetrachloride	1,800	280
Chlorobenzene	590	26
Chloroform	1,800	79
2-Chlorophenol	200	8.8
1,2-Dichlorobenzene	160	11
1,3-Dichlorobenzene	250	87
1,4-Dichlorobenzene	110	43
1,2-Dichloroethane	12,000	3,500
1,1-Dichloroethylene	1,500	78
1,2-trans-Dichloroethylene	7,000	310

a Pentachlorophenol AAC = $e^{[1.005(pH) - 4.8725]}$

b Pentachlorophenol CAC = $e^{[1.005(pH) - 5.3799]}$

* Acute Aquatic Criterion (AAC), ug/l; maximum concentration.

** Chronic Aquatic Criterion (CAC), ug/l; 30 day average.

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TABLE 3 (Continued)

OHIO EPA AQUATIC LIFE WATER QUALITY CRITERIA
(all concentrations in ug/l)

Compound	AAC*	CAC**
2,4-Dichlorophenol	200	18
Diethylamine	5,600	250
Diethyl phthalate	2,600	120
Dimethyl phthalate	1,700	73
Di-n-butyl phthalate	350	190
2,6-Dinitrotoluene	950	42
Ethylbenzene	1,400	62
Ethylene glycol	4,100,000	180,000
Fluoranthene	400	8.9
Isophorone	6,000	900
Methylene chloride	9,700	430
2-Methylphenol	500	22
4-Methylphenol	140	6.2
Napthalene	160	44
Nitrobenzene	1,350	740
4-Nitrophenol	790	35
N-Nitrosodiphenylamine	290	13
Pentachlorophenol	a	b
Phenol (Warmwater Habitat)	5,300	370
(Coldwater Habitat)	5,000	200

a Pentachlorophenol AAC = $e^{[1.005(pH) - 4.8725]}$

b Pentachlorophenol CAC = $e^{[1.005(pH) - 5.3799]}$

* Acute Aquatic Criterion (AAC), ug/l; maximum concentration.

** Chronic Aquatic Criterion (CAC), ug/l; 30 day average.

waste must be managed in accordance with RCRA. [Relevant and Appropriate]

e) U.S. EPA Groundwater Protection Strategy, August 1984. Identifies groundwater quality to be achieved during remedial actions based on aquifer characteristics and use. [To Be Considered]

f) CERCLA Section 121(d)(3). Sets forth requirements that an off-site facility accepting CERCLA hazardous substances must meet. [Applicable]

g) Ohio Administrative Code 3745-52, 53. Regulates the manifesting and transporting of hazardous waste. [Applicable]

h) Ohio Water Quality Standards, OAC 3745-1. Establishes minimum requirements for surface water quality. [Applicable]

i) Ohio Water Pollution Control, OAC 3745-33. Regulates point source discharges to surface waters of the State. [Applicable]

j) Ohio Water Pollution Control, OAC 3745-31. Establishes requirement for Best Available Technology for any new source of pollution and an anti-degradation policy for waters of the State. [Applicable]

k) Ohio Regulations for Naturally occurring Radioactive Materials OAC 3701-70, 71, and 38 if lead-210 concentrations on spent carbon exceed limits. [Applicable]

l) Federal Stream Dredging Requirements, Section 404 CWA, if Metzger Ditch needs to be dredged. [Applicable]

m) State Stream Dredging Requirements, 401 Certification of dredging projects, if Metzger Ditch needs to be dredged. [Applicable]

3. Location Specific ARARs

The Agency has identified no location specific ARARs. The site does not contain a wetland. Nor is it a National Historic Site.

C. Cost Effectiveness: The selected remedy is cost effective. It is protective of human health and the environment, attains ARARs, and through a variety of measures, ensures long-term

TABLE 8 (Continued)

OHIO EPA AQUATIC LIFE WATER QUALITY CRITERIA
(all concentrations in ug/l)

Compound	AAC*	CAC**
Styrene	1,250	56
1,1,2,2-Tetrachloroethane	1,000	360
Tetrachloroethylene	540	73
Thallium	71	16
Toluene	2,400	1,700
1,2,4-Trichlorobenzene	150	77
1,1,1-Trichloroethane	2,000	88
1,1,2-Trichloroethane	2,000	650
Trichloroethylene	1,700	75
2,4,6-Trichlorophenol	16	2.5

a Pentachlorophenol AAC = $e^{[1.005(pH) - 4.8725]}$

b Pentachlorophenol CAC = $e^{[1.005(pH) - 5.3799]}$

* Acute Aquatic Criterion (AAC), ug/l; maximum concentration.

** Chronic Aquatic Criterion (CAC), ug/l; 30 day average.

effectiveness with proper operation and maintenance. The selected remedy is less costly than Alternative 2B while providing equal protectiveness. Although the no action alternative is the least expensive, it does not provide overall protection of human health or the environment and does not attain ARARs. The selected remedy provides a degree of protectiveness proportionate to its cost.

D. Utilization of Permanent Solutions and Alternative Treatment or Resource Recovery Technologies to the Maximum Extent Practicable: Although permanent treatment technologies are used to address the existing groundwater contamination and landfill gas generated in the landfill, the primary source will be addressed by containment. The selected remedy represents the maximum extent to which permanent solutions and treatment can be practicably utilized for this action. Because of the disposal area size; the fact that there are no on-site hot spots representing major sources of contamination; and the difficulties, risk, and cost involved with implementing a source treatment remedy, it is not practicable to treat the source area. Compared to the no action alternative and Alternative 2B, the selected remedy represents the best balance among the nine criteria and is the most appropriate solution for the site.

E. Preference for Treatment as a Principal Element: Only a portion of the selected remedy, ground water extraction and treatment and landfill gas collection and flaring, satisfies the statutory preference for treatment. A principal threat, the landfill/source area will be contained rather than treated. Because of the disposal area size; the fact that there are no on-site "hot spots" representing major sources of contamination; and the difficulties, risk, and cost involved with implementing a source treatment remedy, it is not practicable to treat the disposal area.

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List of Figures and Tables